Note: Use 'Hyperlinks' to move to the section/ paper you require and to 'return to contents.'

Contents

Editorial

It is with great pleasure that we bring you this collection of contributions, which serve as the record of the proceedings of the Environmental Management for Sustainable Universities (EMSU) 2002 Conference, held at Rhodes University in Grahamstown, South Africa on 11-13 September. The conference takes place at an historic time - soon after the World Summit on Sustainable Development, held in Johannesburg from 29 August 2002 – 4 September 2002. The conference was conceived as a 'linked event' to this summit, and therefore carries some of the WSSD issues into further discussion and debate, amongst educators and administrators of Higher Education. The Conference has drawn participants from around the globe, from all of the world's continents, and from over 30 countries.

The theme of the Conference is *'The Role of Higher Education in Sustainable Development'*. The conference was planned to challenge leaders in Higher Education to report on environmental innovations, research and management practices in an international forum. Being linked to the WSSD, it furthermore challenges leaders in Higher Education to examine their own teaching, research and practice in the context of global and local priorities. The Johannesburg agenda for the WSSD has a number of background themes that run through all the debates at the Summit. Key amongst these is the question about what fairness means within a finite environmental space, and what our responsibilities as global citizens are in the context of this enormously complex and ambivalent question. Holding the conference in Africa draws attention to the global paradox that poverty alleviation cannot be separated from wealth alleviation, and that all have a responsibility to ensure global equity and sustainable utilization of resources for present and future generations. As can be seen from a number of contributions to this conference, this involves changes in values, actions and habit. It also involves commitment, motivation and a sense of purpose. High quality socio-ecological and socio-economic research, and changes to conventional teaching methods and approaches are needed to enable capacity building amongst students, and the current managers and leaders in our institutions.

The keynote address by Charles Hopkins of the UNITWIN/ UNESCO Chair at York University reflects on how education (which includes the role of Higher Education) has become a 'priority of mention' in sustainability declarations, but a 'forgotten priority' when it comes to funding and actual program delivery. He also draws attention to equity issues in education. His address is followed by an African perspective, and we have invited Njogu Barua from EcoNews Africa (an activist NGO) in Kenya to provide a 'people's perspective' on the debates at the WSSD. This address will enable us to contextualise the conference, by paying attention to the sustainable development issues and perspectives relevant to our host continent, and the communities that need to be served by Higher Education in Africa.

Conference contributions have scoped the role of Higher Education in Sustainable Development to be integrated, challenging and often paradoxical. From contributions in these proceedings we see that the Role of Higher Education in Sustainable Development includes:

- Implementation of Environmental Management Systems in Higher Education– the proceedings reflect both success stories and enormous challenges in this arena of practice.
- Development of curricula, programmes and educational processes – the proceedings reflect innovation, changes in approaches to teaching and learning, and the problems being experienced in enabling change in traditional academic cultures and settings.
- Academic debates on the notion of sustainability, sustainable development and the realizing of these global change objectives in higher education– contributions here reflect a concern for the conceptual, the socio-political, and socio-ecological dimensions of sustainable development, as well as the frustration that many experience in trying to frame thinking and practice within the ambiguous, shifting terrain– named 'sustainable development'.
- Student and staff action for change at a local, campus-based level – contributions reflect successes, and some of the difficulties of enabling change at a practical, local level where we need to change buying patterns and paper-use habits (for example), and motivate others to make meaningful contributions to change.

The conference provides a meeting place for academics, students and university administrators to meet and debate issues of common concern, notably our lifestyle and environmental management choices. The keynote address by Fransisco Lozano Garcia from Mexico provides a real-world reflection of what the meeting of academics, students, communities and administrators involves. His address is inspirational as it reports on not only a one-campus story, but on a story involving a 32-campus network of universities spread throughout Mexico and Latin America. It reflects the challenges posed to educators in Chapters 35, 36 and 37 of Agenda 21.

To ensure meaningful and clearly articulated outcomes for the conference, we invited Dr Eureta Janse van Rensburg (Research Fellow to the Rhodes University Faculty of Education) to Chair the Conference and lead the final panel discussion. Dr Janse van Rensburg has been instrumental in ensuring a strong focus on environmental learning and research at Rhodes University, during her time as the Murray & Roberts Chair of Environmental Education (1990 – 2000). On request of the university administration, she convened and supported the establishment of the Rhodes University Environmental Policy, thus initiating and supporting environmental management practices at Rhodes University. She participated in inter-departmental research projects and provided conceptual and research-based leadership to re-orient curriculum and research in higher education, and established an environmental policy within her own department.

The conference proceedings are, as yet, not a comprehensive record of the conference, as at the time of going to press, all contributions were not available. We have, however, endeavored to include all the abstracts, and where possible, the full papers. Our first consideration was to make the proceedings available in time for the start of the Conference. For this reason not all contributions have been edited to a common format. Please bear this in mind when you quote from this document, and follow up with the contributors if you have any queries regarding their papers (see list of delegates for contact details).

Editorial

We believe that the Proceedings reflect the rich mix of inputs made at EMSU 2002. Aside from the contributions recorded here, the conference included a wide range of discussions, as well as opportunities to look at sustainability issues within the South African context, through the introductory tours in Grahamstown and the excursion to the University of Port Elizabeth and Addo. The sub themes of the conference have all been well represented at EMSU 2002. The papers and stories indicate a willingness, in particular, to develop EMS at Universities and to ensure that curriculum development and research play a role in enabling sustainable development.

We hope that you will be able to share the findings of this conference (in the form of these proceedings) with other educators, students, academics, administrators and communities around the globe, in attempts to further the goal of better environmental management and more sustainable life styles on a just and healthy planet!

Prof Heila Lotz-Sisitka
Murray & Roberts Chair of Environmental Education
(EMSU 2002 Conference Programme Manager)

Nick Hamer
EMSU 2002 Conference Programme Co-ordinator

These proceedings were compiled by Nick Hamer and brought to you by the Rhodes University Environmental Education Unit, with the support of Murray & Roberts and Gold Fields - who fund the work of the Environmental Education Unit.

Keynote addresses

1. The Role of Education in attaining a Sustainable Future

Charles Hopkins,

UNITWIN / UNESCO Chair at York University

Abstract
Since the inception of the concept of sustainable development in the mid 1980's there has been much discussion regarding the challenges and opportunities of moving towards a more sustainable future. Included in both listings of challenges and opportunities, is education in all its forms.

In the 90's and beyond, education has become a "priority of mention" in sustainability declarations and national planning documents. Unfortunately, in most cases it is also the "forgotten priority" when it comes to funding and actual program delivery. A wide gap exists between the recognition of the need for education's contribution and the reality of the actual delivery to date.

A major contribution of education beyond building public awareness and understanding is the promotion of basic education. Inherent in the concept of sustainability is a just and equitable world. This can only be achieved by providing the current disadvantaged with the means to participate equally in society. A first step is to equip them with knowledge and training that will enable them to participate on an equal basis. This is currently not the case. Over 100 million children between the ages of 6 and 11 never attend school and tens of millions drop out of school in the first few years. Moreover there are an estimated 800 million illiterate adults. The consequences are enormous not only to the individual but to those who support them and the nation as well.

The need for basic and secondary education to address sustainability has grabbed international attention; however, the need for higher education is equally important. A subtle combination of higher education, research, and life-long learning must exist for a nation to shift to a sustainable knowledge-based economy-fueled less on imported technology and more on local innovation and creativity. It is here in higher education that the future leaders of society are educated. If these young people are expected to eventually lead all sectors of society in a world striving toward sustainability, then higher education must become both prepared and be made accessible to those who are capable of learning at this level.

Chapter 36 also emphasized reorienting existing education toward sustainable development. While it is evident that it is difficult to teach environmental literacy without basic literacy, it is also evident that simply increasing basic literacy, as it is currently taught in most countries, will not support a sustainable society. In fact, the most educated nations have the highest per-capita rates of consumption and currently leave the deepest ecological footprints. More education has not yet led to sustainability. Simply educating the citizenry to higher levels is not sufficient to attain sustainable societies.

Fortunately, formal education does not carry this educational responsibility alone. The nonformal educational sector and informal educational sector of the educational community must work cooperatively with the formal educational sector for the education of people in all generations and walks of life. There is a tremendous need to work together to accomplish sustainability goals.

2. African Interests and Priorities at the World Summit on Sustainable Development (WSSD)

Njogu Barua

Econews Africa, Kenya.

Abstract

The Road Map towards the World Summit on Sustainable Development in most parts of Africa started in the year 2001. This was immediately after the First Preparatory Conference (PrepCom) towards the Summit held in January 2002 at the United Nations Headquarters in New York. This being the first meeting in the process was to a large extent a planning one and organization of work for both the Governments and the Civil Society actors.

Apparently to the United Nations level, developed nations and proponents and sympathizers of the neo-liberal paradigm, this first PrepCom was viewed as a success. On the contrary, it was viewed as an attempt to suppress the voice of the communities from developing countries of the South, and in particular Africa, who were poorly represented, and also misrepresented by Northern Networks and organizations operating in the South.

In terns of process, the leading events in which Africa's priorities and interests were identified include rigorous national consultation processes by both the governments and the Civil Society at national, sub regional and regional levels; the tri-faceted African regional PrepCom (comprising of parallel sessions for Governments, Civil Society and Industry) held in Nairobi (October 200); First Pan African Conference for Civil Society
Organizations towards WSDD and beyond held in Nairobi (January 2002); and Second Pan African Conference for Civil Society Organizations towards the WSDD and beyond held in Abidjan (July, 2002).

This paper will discuss the key issues that were identified during the above meetings as being of concern and priority for Africa namely Poverty Eradication (some say alleviation); Energy and Technology transfer; Natural Resources Management; New Partnership for African Development (NEPAD); Financing for Sustainable Development; Governance; as well as Africa and Globalization.

3. Monterrey Tec's *Sustainable Development* Program: Visions, Dimensions and Progress

Francisco J. Lozano-García ,

ITESM Campus Monterrey, Mexico

Monterrey Tec's *Sustainable Development* Program: Visions, Dimensions and Progress

Francisco J. Lozano-García, Center for Environmental Quality, ITESM Campus Monterrey, Av. E. Garza Sada # 2501, Monterrey, Nuevo León, 64849 Mexico. fjlozano@itesm.mx.

Don Huisingh, The Center for Clean Products and Clean Technologies at the University of Tennessee, Knoxville. 311 Conference Center Building. Knoxville, TN 37996-4134, U.S.A. dhuisingh@utk.edu
Mónica Delgado-Fabián, Residence Halls, ITESM Campus Monterrey, Av. E. Garza Sada # 2501, Monterrey, Nuevo León, 64849 Mexico.
monica.delgado@itesm.mx

Abstract
This paper reviews some of the responsibilities we as educators have been mandated to address within Chapters 35, 36 & 37 of Agenda 21. It also reports on the Sustainable Development Program that is being developed and implemented at Monterrey Tec, in Monterrey, Mexico, in response to these mandates.

Monterrey Tec is a 32-campus network of universities spread throughout Mexico and Latin America. Its basic mission supports the new and expanded emphasis upon Sustainable Development (SD) that is being developed and implemented at Tec.

Tec's SD program is comprised of the following six, interconnected elements:

a. Weave SD concepts, as the "*Golden Thread*," throughout all courses and curricula, on all 32 campuses;
b. Operate the physical facilities, of all campuses, based upon *Sustainability* criteria;
c. Ensure that *Sustainability* is incorporated, as the contextual framework, for disciplinary and multidisciplinary research;
d. Coordinate and integrate Tec's *Societal Outreach* , among stakeholders that play important roles in Mexican Society;
e. Prepare and disseminate, internally and externally, regular reports of Tec's SD, plans, programs and progress;

f. Support, plan and hold "*High Level Conferences"* on "*Conservation and Sustainable Development,"* twice a year, in coordination with the Mexican, National Secretary of Environment and Natural Resources.

This paper elaborates upon the visions and progress made thus far, to realize Tec's SD program. It also addressed the broader implications of such activities for all of us as educators in all countries of the world.

Key words: Sustainable Development Education, Higher Education for Sustainable Development, Greening of Campuses.

Introduction

During the last ten years, at the main campus of the Instituto Tecnológico y de Estudios Superiores de Monterrey **(Tec)** Monterrey, Mexico and throughout its 32-campus network, has placed increasing emphasis upon "*Sustainable Development."* This is in keeping with Tec's overall Mission Statement that states:

> ***"The Monterrey Institute of Technology University System has the mission of educating individuals who are committed to the social, economic and political improvement of their communities, and who are internationally competitive in their areas of specialty. Carrying out research and extension relevant to Mexico's sustainable development is also part of the Institute's mission,"***

Building upon Tec's basic mission, its expanded SD program is now being built upon the "Agenda for Change," or the so-called "Agenda 21," that was developed during the process of the 1992 Earth Summit held in Rio de Janeiro, Brazil. The Agenda contains forty chapters that highlight key issues that must be addressed if we are to progress toward the goal of Sustainable Societies.

Educators, responsibilities are especially highlighted within Chapters 35, 36 and 37. They have been used to further clarify and focus Tec's SD program.

From Agenda Chapter 35, "Science for Sustainable Development," it is clear that the present trajectory of human development is unsustainable and that much must be done to change the course. An essential element of making prudent directional changes is the development and utilization of new science of the natural, social, economic systems. The writers of Agenda 21[1], state:

> **"Countries need to develop tools for sustainable development such as: 1. Quality-of-life indicators covering health, education, social welfare and the state of the**

[1] United Nations Agenda 21, Chapter 36: Promoting Education, Public Awareness And Training

Also available on-line: http://www.un.org/esa/sustdev/agenda21chapter36.htm

environment and the economy. 2. Economic incentives that will encourage better resource management, 3. Ways of measuring the environmental soundness of new technologies."

From Chapter 36, "Education, Training and Public Awareness,' it is clear that university faculty have several key responsibilities. Among them are the following:

"To improve sustainable development education, nations should seek to:

a. Make environment and development education available to people of all ages;
b. Incorporate environment and development concepts, including those of population, into all educational programmes, with analysis of the causes of the major issues. There should also be a special emphasis on training decision makers.
c. Involve school children in local and regional studies on environmental health.

Since the world needs a flexible and adaptable work force, equipped to meet growing environment and development problems, and changes during the transition to sustainable societies, countries should:

a. Set up training programmes for school and university graduates to help them achieve sustainable livelihoods.
b. Encourage all sectors of society, including industry, universities, governments, non-governmental organizations and community organizations, to train people in environmental management.
c. Provide locally trained and recruited environmental technicians to give local communities services they require, starting with primary environmental care.
d. Work with the media, theatre groups, entertainment and advertising industries, to promote a more active publish debate on the environment.
e. Bring indigenous peoples' experience and understanding of sustainable into education and training."

In summary, Chapter 36 mandates that we as educators "*Make environment and development education and training available to people of all ages."*

In Chapter 37, "Creating Capacity for Sustainable Development," educators are given key responsibilities in working with all sectors of society. We are reminded that:

"A country's ability to develop more sustain ably, depends on the capacity of its people and institutions to understand complex environment and development issues so that they can make the right choices. People need the expertise to understand the potential and the limits of the environment. They will face difficult policy choices when dealing with such complex problems as global

climate change and protecting biodiversity. This will require scientific, technological, organizational, institutional and other skills.

Capacity Building **is an essential step in preparing national sustainable development strategies and Agenda 21 Action Plans."**

In summary, Chapters 35, 36 and 37, of Agenda 21 enunciate many responsibilities that educators, at all levels, have for helping their societies make the transition from unsustainable to sustainable societal values, policies and practices.

In addition to the Agenda 21 guidelines for the educators, Tec has drawn inspiration and guidance from sources such as the Talloires, Halifax, Swansea, Kyoto and Hermosillo Declarations and from the Copernicus Charter.

Beyond these conceptual and values' based directives, no campus SD program will succeed unless it also has the following two commitment and involvement elements:

a. The full and enthusiastic support of the president of the University.
   (Tec's new president is fully supportive of all dimensions of the SD program and has officially launched a full-fledged campaign to accelerate implementation of all dimensions of Tec's SD program.)

b. Enthusiastic involvement of faculty, staff and students in ensuring that the visions, commitments, responsibilities and activities of the SD program are comprehensively developed, shared, supported and implemented.
   (This part of Tec's SD program is evolving.)

With these foundations, Tec's SD program is being developed, implemented, documented and continues to evolve as new knowledge, products or concepts are developed.

The overall program in comprised of six elements that are outlined in this section and are addressed, in depth, in the body of this paper. The six elements are:

a. **Weave** "*Sustainable Development*" concepts, as the "*Golden Thread*," throughout all courses and curricula, on all 32 campuses of the Tec University System;

b. **Operate** the physical facilities, of all campuses, based upon *Sustainability* criteria;

c. **Ensure** that *Sustainability* is incorporated, as the contextual framework, for disciplinary and multidisciplinary research;

d. **Coordinate and integrate** Tec's *Societal Outreach* , among stakeholders that play important roles in Mexican Society;

e. **Prepare and disseminate**, internally and externally, regular reports of Tec's SD, plans, programs and progress;

f. **Support, plan and hold***High Level Conferences* on "*Conservation and Sustainable Development,"* twice a year, in coordination with the Mexican, National Secretary of Environment and Natural Resources.

Development and Implementation of Tec's SD Program

PROGRAM INFORMATION.

Within the various activities being implemented, we have "**Documentation of current practices within Tec**" in the various areas stated above. It will serve as the baseline from which to make plans for and to monitor improvements as the Program evolves, hence following the main activities are presented.

1.1 **Weave** "*Sustainable Development*" concepts, as the "*Golden Thread*," throughout all courses and curricula, on all 32 campuses of the Tec University system.

TEC'S COURSES AND CURRICULA THAT CURRENTLY CONTAIN ELEMENTS OF SD:

The process of integrating SD concepts into courses and curricula has been underway in some departments and institutes for at least 10 years. To illustrate this, the data presented in Tables I - IV document the departments, courses and scope or content on SD that has been incorporated. The tables reveal that some courses within Chemical Engineering, Economics and the MBA, have made clear progress.

Table I. Courses and Curricula within DIA – Engineering and Architecture Division that currently contains emphases upon SD.

Department	Semester	Course	Scope / Content
Chemical Engineering	Eighth	Process Re-engineering Ig – 95 – 882	Analyse Chemical Processes utilizing the Eco-efficiency criteria. Capital Investment Cost and Production cost evaluation. Environmental Impact considerations and Environmental Risk analysis are integrated. Values added in chemical products are subjected to eco and human toxicity criteria. The historical evolution of chemical processes is addressed. Material's and Energy Flow analysis and Sustainable

			development are addressed.
Chemical Engineering	Eighth and Ninth	Environmental Management Ig – 95 – 981	Develop, in the students, an overall view for environmental management within Process industries based on pollution prevention and cleaner production measures, taking into account environmental, social, economic, legal and technological issues.
Chemical Engineering	Graduate	Ecoefficient Process Analysis Ig – 99 – 256	Ecoefficiency and Industrial ecology concepts are central. Criteria to analyse ecoefficient processes are utilized. The World Business Council for Sustainable Development criteria are used. Case studies for different process industry areas. Long-term vision is fostered regarding the links between Sustainable Development and all Chemical Process Industries.
Natural Resources	Variable	Ecology and Sustainable Development Rn – 00 – 802	Introduce students to environmental problems, theories, concepts and approaches for solving the problems. These are integrated with their future professional disciplines through an integrated approach to SD that addresses Ecology, Economics and Social, Cultural and Politics facets of human existence in contemporary and future societies.
Physics	Fourth	Alternative Energy Sources	Provide a review of the renewable energy source options. Learn the physical, physical-chemical, and technological principles for the different energy sources. Comparative economic analyses are also addressed. The first part deals specifically with renewable sources and sustainable development.

Table II. Courses and Curricula within DAF – Administration, Management and Finance Division, that currently contains emphases upon SD.

Department	Semester	Course	Scope / Content
Economics	First	Economics core course EC – 00 – 821	The course goal is to introduce the students to the concepts, tools and logical processes required to study economics and the understanding of actual economic phenomena

			with special emphasis in economic agents. In this regard, theme seven of the course specifically addresses environmental and sustainability issues are discussed in regard to accounting.
Economics	Second	Principles of Macroeconomics EC – 00 – 812	In this course, within the national accounting processes, the need to include, in the calculations for the Gross Domestic Product, the natural resources and environmental costs, is analysed. Also, the themes of poverty and income distribution, as well as consumption and investment are studied theoretically and are applied using cases of the U.S.A. and Mexico, because they are closely linked to the issue of SD, in both nations.
Economics	Second	International Economic Policy	At the end of the course, commercial policies harmonisation is studied. Within this section, the relation between free trade and environment is studied. In the last theme of the course, which addresses the relation among Fiscal policy, Social policy and Free trade, the need to harmonise Social policies among trading partners is addressed.
Economics	Fourth	Macroeconomics Theory I EC - 00 – 855	This is a basic course that addresses environmental and sustainability issues. It is structured into two parts: Firstly, Consumer choice theory and secondly its applications. The latter deals specifically with the conceptual and methodological bases, in regards to interchange and efficiency and its impact on resource management.
Economics	Fifth	Macroeconomics Theory II EC – 00 – 856	This course utilizes mathematical analysis to provide insight into price and production decisions within enterprises, viewed through alternative market structures. Various themes are related with special interest in Sustainability from a microeconomic perspective.
Economics	Seventh	International Trade Economy and Policy	Within Trade Policy, the effects upon pure economic welfare, as a product of applying different orthodox protection tools are studied. A consideration of trade imp act on

		EC – 00 – 874	environment is analysed. The negative impact is taken into account for the case when trade allows income, demand and production growth; also the case for positive impact is considered when competence allows markets to be dominated by the most efficient producers, that is those who incur lesser comparative costs, hence those who cause a lesser relative environmental damage. A specific theme is Ecology or Protectionism?
Economics	Eight	Economic development EC – 00 – 004	The student learns, through amp le reading and reflection, that sustainability is a part of development, in the sense of a multidimensional process involving Economic, Social, Political, Cultural, Ecological and Technological dimensions. As a consequence the sustainability component is present in the four parts of the course. Economic development within the context of economic development theories, sector economic development and development planning and policies.
Economics	Ninth	Social project evaluation EC – 00 – 883	Project evaluation criteria are studied with special emphasis in social and economic impacts in regards of local, regional and national development. The analyses integrate development in relation to environmental impacts and overall sustainability goals.
Economics	Ninth	Natural resources economics EC – 00 – 002	This course integrates economic theory tools with the problems and concepts of natural resources and the environment in order to provide a deeper understanding and proper decision-making. The relation among an efficient use of natural resources and the dynamics of origin, supply, renewal, consumption and extinction of some of the main natural resources is the central core of the course.
Economics	Ninth	Regional economics	Students focus on a territorial economic analysis. A spinning axis is used to help them understand the interactions of economic activities within the regional society. Hence,

			regional sustainable development is centrally important in this course.

Table III. Courses and Curricula within the DECIC – Electronics, Computation, Information and Communications Division, that currently contain emphases upon SD.

Department	Level	Course	Scope / Content
CADS	Graduate	Leadership for Sustainable Development Ds – 95 - 205	This is a Core course (Compulsory for all graduate students) and it is oriented towards increasing awareness and commitment to act, as agents of change when facing ecological, economic and social challenges those organisations must address in the XXI century.

Table IV. Courses and curricula in EGADE –Graduate School of Business that currently contain emphases upon SD.

Department	Semester	Course	Scope / Content
EGADE	Graduate MBA	Value Chain Management GA-00-232	• What does it mean to be green? • Production processes aimed at protecting the environment (the Saturn Company Case) • ISO 14000 • Inventories and just-in time: waste reduction in the inventories and just-in-time concepts • Product design and process selection: environmentally conscious design • Plant layout decisions and stakeholders
EGADE	Graduate MBA	Human Dynamics in Organizations GA-00-233	• Internal and external resources for social investment projects that protect the environment • Synergies with the community for social investment projects

			• Project management of social investment projects
EGADE	Graduate MBA	Strategy, Structure and Processes in Organizations GA-00-234	• Environment and business leadership • Socio -economic impact assessment • Change management • Investor relations • Sustainable development • Stewardship
EGADE	Graduate MBA	Capstone Seminar: Corporate and Global Strategies GA-00-911	• Host government pressures • Host government inducements • Community reactions • Life cycle strategies • Development of core competences for sustainability • Transfer of core competences • Resource focused utilization
EGADE	Graduate MBA	Capstone Seminar: Business Policy	• Sustainable development • Supply chain management from cradle to cradle
EGADE	Graduate MBA	Leadership for Sustainable Development	• Environmental policies and voluntary programs • Sustainable development • Climate change • Integrated Product Policy (IPP) • European Commission Directive Environmental policies • Environmental standards (series ISO, EMAS, others) • Product responsibility and take -back • Toxics release inventory • Environmental regulations and policies with focus on product end-of-life management issues • Environmental philosophies • Green Design • Designing for the environment • Industrial ecology • Environmental principles, environmental management systems

			and ISO standards • Coalition for Environmentally Responsible Economics (CERES) • Environmental Management Systems • ISO Standards • Eco Management and Audit Scheme (EMAS) • Environmental reporting • Life cycle tools, methodologies and examples • Methodologies of life cycle analysis from ISO, SETAC, others • Life cycle management • Full cost accounting • Economic input-output analysis (EIO-LCA) • Advantages and disadvantages of introducing environmental costs as part of accounting systems in a corporation • The perils of doing the right thing • Environmentally sustainable aspects of corporations and suppliers • Benefits of introducing environmental aspects in the objectives of a corporation • Life cycle of products and the role of suppliers in the life cycle chain
EGADE	Graduate MBA	Management Philosophy Seminar	• Environmental justice • Negotiating with stakeholders • Crisis management
EGADE	Graduate MBA	Creating Competitive Advantage in Organisations	• Clean supplier's systems • Suppliers development programs • Measurement systems for ecological variables • Maintenance of equipment and installations • Quality assurance
EGADE	Graduate	Ideology and Mentality in	• Environmental culture in Latin America

	MBA	Latin American Organisations	• Ideology and its impact on resource preservation and allocation
EGADE	Graduate MBA	Strategic Alliances and Redesign	• Corporate stakeholders and their social responsibility to the environment • Technological innovation for sustainable development
EGADE	Graduate MBA	New Paradigms for Organisational Learning	• Environment and business leadership
EGADE	Graduate MBA	Financial Engineering	• Carbon dioxide and nitrates • Trading permits • The use of real options to assess ecological projects • Project financing and implications in Ecology
EGADE	Graduate MBA	Finance Project	• Environmental Projects Management
EGADE	Graduate MBA	Introduction to Electronic Commerce	• Transformation: electronic vs. printed media (paperless administration) • Industry chain -value transformation
EGADE	Graduate MBA	Consumer Behaviour	• Environmental aspects of decision making • Ecological movements and consumer protection • Environmental-awareness oriented marketing strategies
EGADE	Graduate MBA	Corporate Image	• Crisis management (Exxon Case)
EGADE	Graduate MBA	Negotiation Skills in the International Context	• Environmental negotiations • Student research on environmental negotiation efforts

EGADE	Graduate MBA	Corporate Communication	• Corporate image, its elements and the necessary harmony of architecture and infrastructure with the environment
EGADE	Graduate MBA	Social Project Evaluation	• New dimension of cost/benefit analysis, involving environmental costs • Institutional change • Environmental dimension of social projects
EGADE	Graduate MBA	Public Policy and Institutions Development	• Application to property rights measures and design, negative environmental externalities, taxation, design of alternative subsidies
EGADE	Graduate MBA	Technology Development and Competitiveness	• Strategies for clean technology development • Effects of environmental decisions on technology strategy
EGADE	Graduate MBA	Corporate Environmental Strategy	• What is corporate environmental strategy? • The process of strategic management • External and internal analysis • Environmental differentiation • Market for environmental technologies and services • Green partnerships with regulatory agencies • Environmental management systems • Relationship between environmental strategy and competitiveness • Environmental accounting • Life cycle analysis • Green marketing and eco-labelling • Measuring environmental performance and financial performance • Triple bottom line
EGADE	Graduate MBA	Global Leadership Program	• Environmental regulations in global businesses • Environmental awareness among stakeholders in different cultures • Ecological responsibility of leaders in a

			global economy

In summary, it is clear from the information presented in Tables I - IV that some course leaders have already made substantial progress in incorporating SD concepts and content into their courses. They are already engaging their students in exercises to provide them with knowledge, insights and skills pertaining to ways they will be able to help their communities, nations and companies make the transition to sustainability.

From the data presented it is clear that much progress, in incorporating SD into their courses and curricula, has been made within Chemical Engineering, Economics and Management.

Additionally, due to a recently held, three day, "Educate-the-Educators," 28 additional faculty from Architecture, Foreign Affairs, Environmental Law, Chemical Engineering and Mechanical Engineering are now in the process of incorporating SD into their courses. Additional training courses are planned for additional groups of faculty during the coming months.

Performance indicators are being developed to monitor the faculty and student performance in actualizing SD.

1.2 **Operate** the physical facilities, of all campuses, based upon *Sustainability* criteria.

SUSTAINABLE CAMPUS OPERATION

This aspect of Tec's SD program includes emphases upon energy, water and material's savings, throughout all campus operations, including:

a. The planning, design, construction and operation of new facilities;
b. The renovation of currently existing facilities;
c. The procurement for all campus activities;
d. The management of wastes such as paper, metals, food, and hazardous materials.

In regard to these four main areas, much in now being done to incorporate Sustainable Design, Life Cycle Operational Costs and Benefits, and related tools and concepts into the design of new facilities. Also, much is being done on renovation and on planning for Green Procurement. However this is a 'Work in Progress,' and at this time, the results are not sufficiently complete for inclusion in this paper.

However, with regard to the operational aspects of the campus extensive data have been assembled since 1995 on:

a. Energy usage;
b. Water usage;
c. Materials separation and recycling;

d. Landscaping and Grounds Maintenance.

The background to Tec's work in this area and data that have been documented for these aspects are presented in the following section.

In 1995 the **"Energy Committee,"** was formed. It has pursued actions designed to achieve significant energy savings in electricity usage, natural gas consumption, air conditioning and reductions in water usage.

Information contained in Table. V highlights, the key areas being addressed at Tec to help to improve its overall campus efficiency. It should be noted that these elements contribute in different ways to the improvements that are being achieved. Some of them are readily quantifiable, others such as a sense of security, are not so readily quantifiable.

Table V. Campus monitoring and maintenance activities designed to help increase materials and energy use efficiency & security.

Electrical energy and Natural gas readings are performed. Data trends and savings calculations are prepared.
Refrigerating water systems and Boilers: They operate according to a document called "Start-up and phase out procedures," wherein the variables that have to be measured are stipulated, as well as the operating conditions for the equipment are specified.
Lighting Program: Fluorescent lamps are being replaced with more energy efficient types, without decreasing lighting levels.
Maintenance Program: It pertains to the procedures for the detection and repair for water, gas and steam leaks, as well as repairing and replacing insulation for refrigerated water and steam pipes. Additionally, there is a schedule for *'cleaning air filters'* of all air-conditioning & heat exchanger equipment. Steam traps in the steam mains pipes are checked weekly for proper operation.
Monitoring of Water Wells: Water extraction is measured to determine consumption of the entire campus community.
Security personnel checklist: The Security personnel are required to ensure building security as well as to turn off lights in rooms that are no longer in use. They also check computers, air-conditioning equipment, ceiling fans, and coffee pots. They turn off such equipment if it is clear that it is not being utilized, at that time, by faculty,

students or staff. They also report any visible water leaks.
Environment temperature: A METASYS monitoring system has been installed to more accurately monitor and control Tec's refrigerated water-cooling equipment. *(METASYS is a data logging system that monitors, in real time, the temperature of the refrigerated water that is used in the cooling of the campus building facilities.)*

Energy savings achieved under the leadership of the Energy Committee.

The 'Energy Committee's' commitment and energy savings efforts resulted in their being awarded the 1995 National Prize for Energy Saving.

Additionally, their 2001 proposal to FIDE, (The Mexican National Energy Saving Committee) was funded for changing to more energy efficient refrigeration equipment that uses HFC 134b instead of CFC.

Electrical Energy Usage at Tec in comparison with data from some European Universities

Due to student population increases at Tec, there have been increases in total energy consumption for the entire campus, throughout the years. (See Fig.1.)

Further, although, the per student energy consumption increased from 1993 to 1998, it has been reduced since then. (See Fig. 2.) It is important to emphasise that such per student, *'normalization,'* is essential for monitoring the relative energy usage. The electrical energy usage on a per student basis in 2001 is now similar to what it was in 1997. The energy conservation efforts at Tec are showing positive results, but much more can be done to further reduce energy consumption. More specific information on energy usage contributors must be obtained so further energy usage reductions can be focussed.

Fig. 1 Total Annual Electrical Energy Consumption at the Monterrey Campus (GigaJoules per annum)

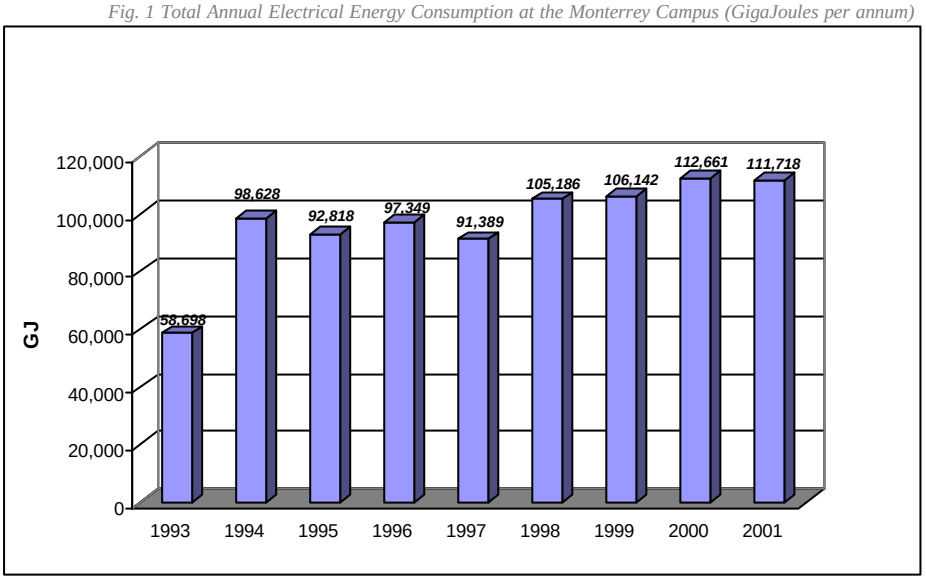
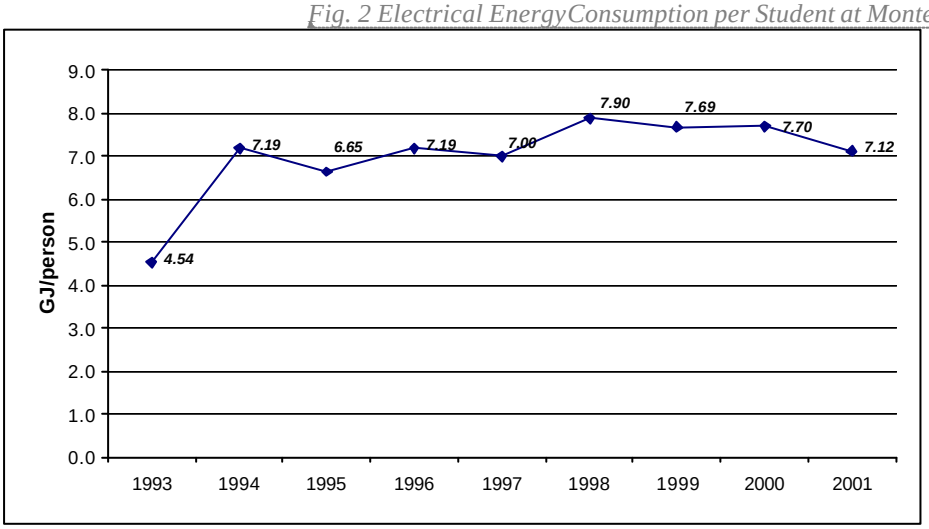


Fig. 2 Electrical EnergyConsumption per Student at Monterrey Tec

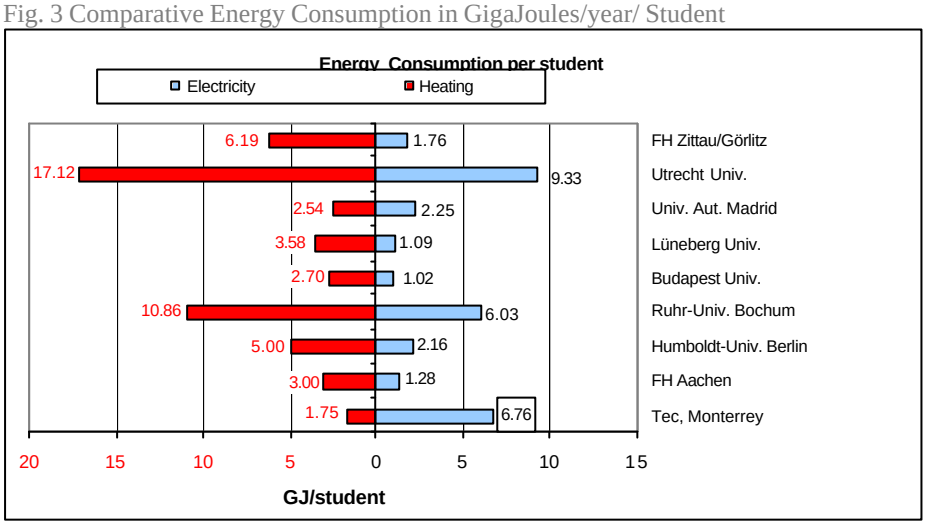
Formatted



Comparing Tec's energy consumption data with the consumption at various European Universities that belong to the Copernicus Charter, it is clear that Tec's per capita electricity consumption is above average, while its per capita consumption of natural gas for heating is the

lowest value of the group. The main reason for these differences is due to different climatic conditions in Monterrey and in Northern Europe. In Northern Europe, more energy is used for heating whereas cooling in the hot season is the dominant energy consumption activity in Monterrey. (See Fig. 3.)

Fig. 3 Comparative Energy Consumption in GigaJoules/year/ Student



(Data for European Universities taken from the Low-Energy Project in Copernicus Campus (http://www.copernicus-campus.org/))

Natural Gas Usage at Tec

At Tec, natural gas is used primarily for heating of buildings, water heating and for cooking. By 2000 & 2001, the *total* annual consumption of natural gas was reduced by approximately 15% compared with the usage in 1996-1997. (See Fig.4.)

Even more dramatically, if the data are calculated on a per student basis, it is clear that steady decreases in consumption of natural gas have been achieved. In fact, on a per student basis, the consumption in 2001 was 28 % lower than it was in 1996. The main reason for these results is that in 1997, the old, inefficient boilers were replaced with new, more efficient ones.

With such per student data, one can more effectively convince campus decision-makers of the economic benefits of these and other types of technological and procedural improvements. Without such data, this would not be possible.

Fig. 4. Total Annual Consumption of Natural Gas at Tec (1996 – 2001)

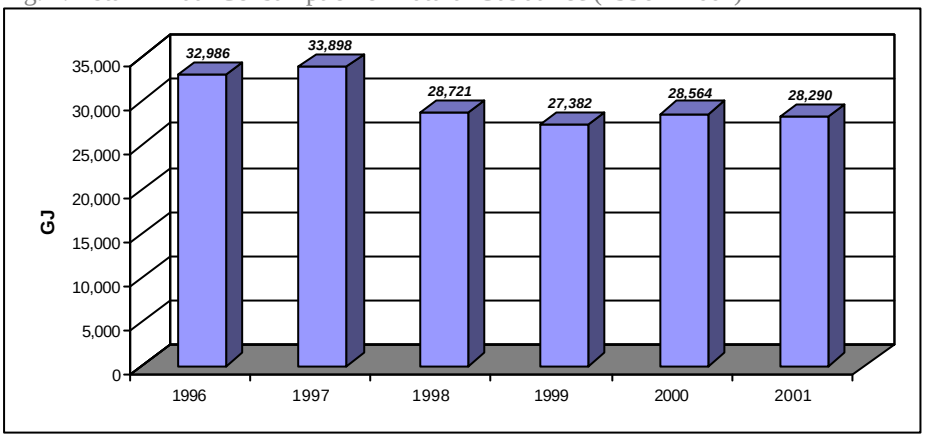
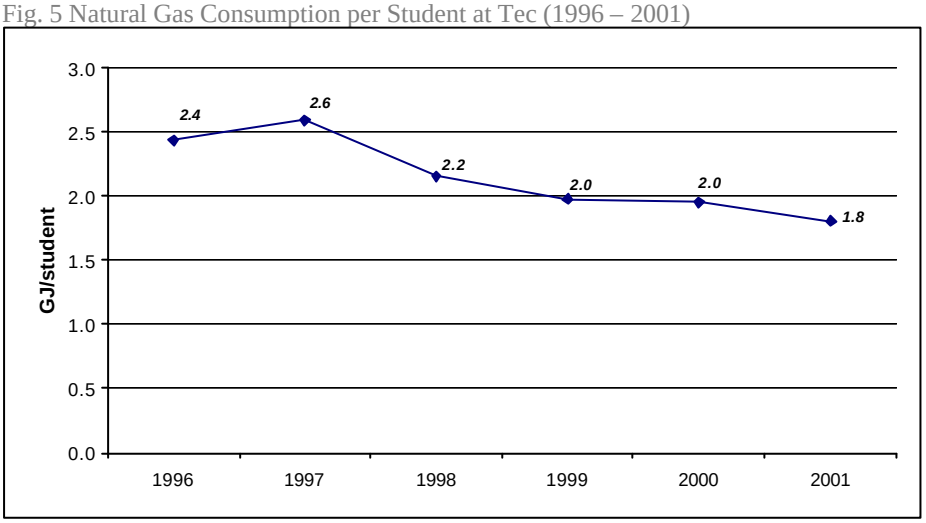


Fig. 5 Natural Gas Consumption per Student at Tec (1996 – 2001)



Water Consumption at Tec.

In 1994, Tec's wastewater treatment plant was put into operation. The plant is designed to be able to treat 600 m^3 of wastewater/day. This treatment plant generates sludge that is utilized to produce compost and treated water, which, respectively are used for campus lawn, fertilisation and irrigation.

The physical plant operations and maintenance staff focus upon many issues, including monitoring and leak detection. They have installed an electrical monitoring system in the water treatment plant to help achieve further water savings.

During the period, 1996 – 2000, water consumption was reduced slightly, in absolute terms.(See Fig. 6.) But it was reduced 16%, on a per student basis. (See Fig. 7.)
These improvements in water usage have been mainly due to more efficient pinpointing of leaks, in the entire water distribution system, and the rapid repair of them.

Fig. 6 Total Annual Water Consumption at Tec from 1998 - 2001.

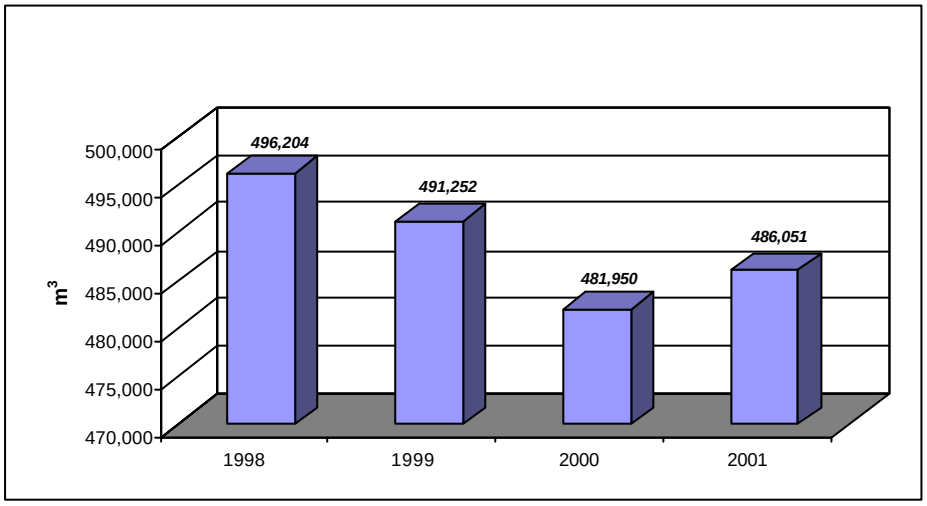
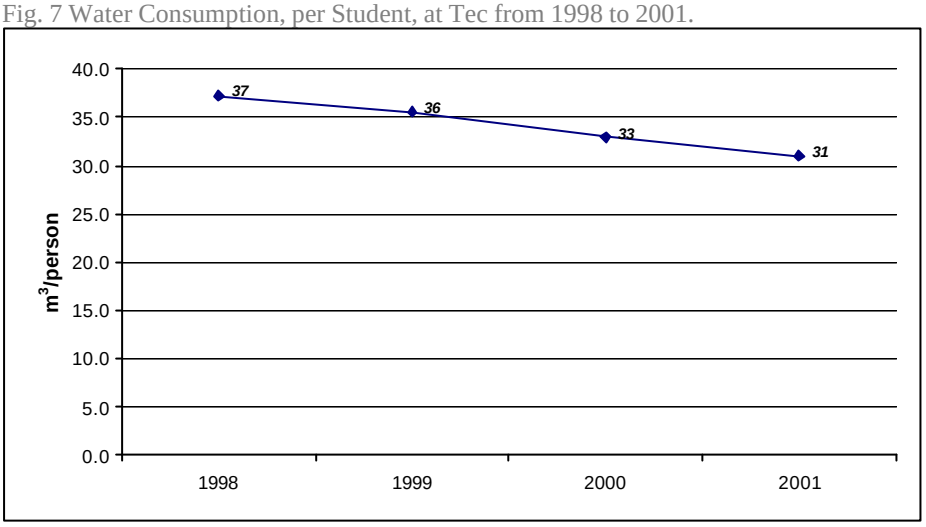


Fig. 7 Water Consumption, per Student, at Tec from 1998 to 2001.



Waste Separation and Recycling

In 1991, the Recycling Committee for Student Residences, Food Services and Physical Plant was established. This committee's responsibility was to sell or reuse the waste being generated on the Campus and to foster a waste separation, waste recycling culture throughout Tec's community. The activities that have been performed include:

Waste Separation in walking corridors (1992): Sets of three containers were placed where the largest amount of waste is generated and labelled as aluminium, plastic and non-separable materials. Currently, performance data are not yet available on the effectivity of these separate waste deposit containers.

Paper Separation at the source (1992): Special paper recycling trays were provided in the following buildings; The President's Office, The Administrative Building, The Lake Office Building 1, The Administration and Social Science Division Building, and in Building # 6. The purpose of these special trays was to foster the separation of paper into two fractions, the reusable paper and paper for recycling. Progress has been made with this but there is now an urgent need to assess its efficiency and to renew efforts to expand the participation of all Tec citizens in increased paper use efficiency and in expanded paper recycling efforts.

Waste Separation in Cafeterias and Refectories (1993): When waste is produced in these facilities, it is separated into the following fractions: organic, cardboard, aluminium, glass and

non-separable. At the present time not all waste is adequately separated in these waste-producing areas. More needs to be done to decrease waste at the source and to improve the efficiency of its reuse.

CFC recovery (1994): Dedicated equipment for recovery, storage and reuse of CFC (Chlorofluorocarbons) is available on the Tec campus. Its main purpose is to reduce the environmental impact of CFC's by preventing them from being released into the atmosphere.

Recovery for Recycling.

Aluminium recovery for recycling has had its up and downs that are attributed mainly to lack of monitoring and staff training,(See Fig. 8)

Fig. 8 Total Quantities of Aluminium recycled from the Tec Campus from 1992 – 2001.

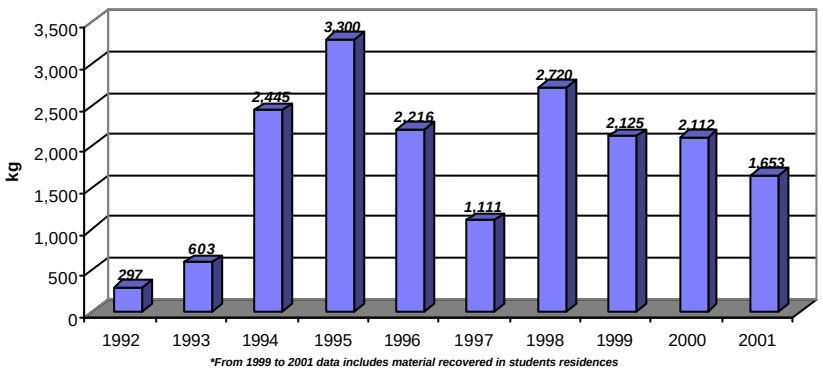
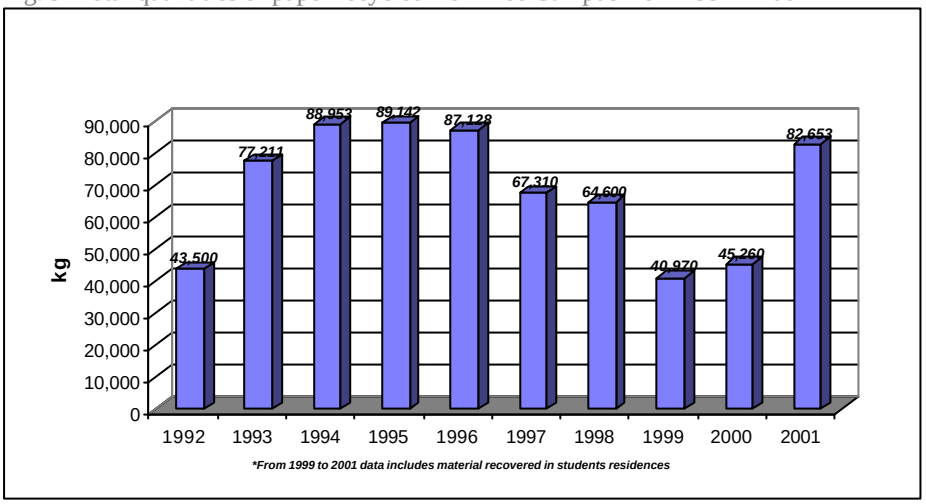


Fig. 9 Total quantities of paper recycled from Tec Campus from 1992 - 2001



As with aluminium recycling so also with paper there have been quite dramatic fluctuations in the amounts recycled. The reasons for these fluctuations in not clear but it was found that when there is a person, on campus, responsible for helping to foster Aluminium or paper recovery, that the amount of materials recycled increases; when there is no designated DRIVER OF RECYCLING, the amounts recycled decreases. There is an important lesson in these findings that will be utilised in developing the new recycling programs. .

Procurement

The process of development of "Green Procurement" guidelines and of a catalogue of 'preferred products,' will soonbe completed. In order to have a baseline, data are being collected to document the quantities of each type of material being purchased, annually. These data will be integrated with the Green Procurement guidelines to establish goals and targets for improving purchasing patterns in order to decrease the environmental footprint and costs of campus purchases. The product groupings for which special attention is currently being given, include:

1. **Cleaning Products**: Data are being compiled according to cleaning product supplier, product name, composition, use, pH, biodegradability, toxicity and department or areas within which it is being used. As soon as possible, safer, greener products will be recommended to replace the ones with unacceptable toxicities or other risks.

2**. Purchases**: Information compilation on purchases done during the previous year for the areas of Food Services and the Main Warehouse is in progress. Products are being classified according to the waste type that will be generated as a result of their usage. .For the Food Services, the

amount of food purchashed per year, was documented. Data will soon be tabulated of the amounts of food waste that are generated. Explorations of possible usages of the wasted food are planned.

Gardens and Landscaping

The Gardens and Landscaping department is responsible for maintenance of the external aesthetic factors for the Campus. How this is done can be an important factor in helping Tec in its transition towards sustainability. A project is being prepared to transform some of the current landscaped areas into a Botanical Garden.
Actions being addressed include:

1. A Landscaping Committee was formed with people from various disciplines;
2. This committee is responsible for:
    a. Preparing an inventory of the Flora species on Campus and for developing a map of their location and distribution;
    b. Identifying the species that are native to the region and those that have been brought in from other areas. Also, they are responsible for preparing a habitat suitability map according to different ecosystem preferences of the different flora. Special habitats will be developed for the diverse species.
    c. Developing information plaques for the plant species.
3. Bird species identification and information plaque production.

Other campus beautification and educational activities are being planned and will be implemented, in keeping with the ecosystem concepts that are being fostered.

1.3 **Ensure** that *Sustainability* is incorporated as the contextual framework for disciplinary and multidisciplinary research.

Evaluations are currently underway of the disciplinary and interdisciplinary research that has been done and is in progress. When the full assessment has been completed, a comprehensive report will be prepared and disseminated.

Additionally, guidelines are being formulated to foster increased inclusion of SD into both disciplinary and interdisciplinary research projects, in the future.

1.4 **Coordinate and integrate** Tec's *Societal Outreach*, among stakeholders that play important roles in Mexican Society. This includes, but is not limited to, the communities within which each of the campuses is physically present, their enterprises, the local, state and federal governments, NGO's and International Environmental agencies such as UNEP, UNIDO and UNESCO.

OUTREACH INCLUDING COMMUNITY AND CONTINUING EDUCATION

The main purpose for promoting outreach into the communities throughout Mexico, is to test, implement and promote activities and projects that foster Sustainable Development in the Community and at the same time to provide opportunities for the Campus Departments or Centres to expand their provision of various types of Continuing Education. With such activities, Faculty and Students can more effectively learn and provide strong involvement within local communities in order to foster progress toward SD.

Two of the organisations that provide direct interaction opportunities with the Community, in outreach programs, include:

Amigos de la Naturaleza (Friends of Nature)

"Amigos de la Naturaleza" was created in 1999 upon an initiative of Ernesto Enkerlin (Centro de Calidad Ambiental y División de Ingeniería y Arquitectura) and Professor Ted Schwartz (Marketing), to provide an extra-curricular environmental training program.

Mission

To foster the development of community leaders who are committed to nature and who wish to help transform Mexican society towards SD.

Services

"Amigos de la Naturaleza" offers:

- ✓ Course Programs on Environmental Community Leadership (4 modules);
- ✓ Community interchanges;
- ✓ Projects with Environmental organisations;
- ✓ Support Network;
- ✓ Extraordinary trips and international events.

Achievements

During a three-semester period, 250 *"Friends of Nature,"* have completed the program. Besides taking this course in a normal face-to-face context, there is also the option to take the modules through the Internet, using the services of Tec.com.

FOMCEC Desarrollo de la Cultura Ecológica (Fostering Ecological Culture)

The organization, FOMCEC was created in 1992 by the American Chamber of Commerce, Monterrey Tec and by the Mexican Institute of Chemical Engineers.

Mission

To foster, within educational institutions, industry and the community, the respect for nature, in its diverse manifestations, and to foster the conservation and preservation of the environment.

Services
FOMCEC offers:
- ✓ Ecological training courses;
- ✓ Project implementation support;
- ✓ Ecological consulting by experts;
- ✓ Library and video services;
- ✓ Program dissemination;
- ✓ FOMCEC Certification Program.

Achievements

The organization developed and offered an *"Ecological Training Course."* The course has been taken by more than 2,000 people from 681 educational and industrial institutions and from the 'community at large'.

Waste minimisation projects for two types of small enterprises have been performed in print shops and in mechanical lathe workshops.

1.5 **Prepare and disseminate**, internally and externally, regular reports of Tec's SD, plans, programs and progress.

PUBLICATIONS AND INFORMATION DISSEMINATION

The Publications and Information dissemination section of the Program will provide an efficient mechanism to keep all stakeholders informed of Tec's SD achievements, plans and activities. The following are two of the main publications that are linked to Tec's SD Program:

Revista de Calidad Ambiental (Environmental Quality Magazine)

This bimonthly magazine is planned and edited by the Centro de Calidad Ambiental, Monterrey Campus. The primary function of the magazine is to provide a forum and publication for the layman, regarding environmental technical and legal education themes, environmental engineering, and ecology. It is designed to help increase societal consciousness about the central importance of natural resource conservation, maintenance of high quality of life and to assist enterprises in to make ecologically and economically sound strategic decisions.
Themes treated; thus, far include: Water quality, Air quality, Sustainable Development, Sustainable Ecosystems management, Soil contamination, Clean Technologies, Ecoefficiency, Chemistry and Environmental toxicity, Environmental management, Pollution prevention, Hazardous waste prevention and management.

Acción Jurídica para el Desarrollo Sostenible (Judicial Action for Sustainable Development)

Chronology

In August 30th 1997, the Commission for Environmental Co-operation was established with funds approved under and provided through the North American Free Trade Agreement (NAFTA. The new publication is named *"Acción Jurídica para el Desarrollo Sostenible" (Judicial Action for Sustainable Development):* it is planned, edited and published by Tec.

MISSION

To promote impartial application of environmental legislation and to foster the rule of law regarding environmental issues in the metropolitan area of Monterrey.

PARTICIPANTS

Centro Jurídico para el Comercio Interamericano (Centro JURICI [Judicial Centre for Interamerican Trade), Department of Law, Protección Jurídica Tecnológico (PROTEC-student association), Monterrey Campus Tec's students.

1.6 **Support, plan and hold** *High Level Conferences* on "*Conservation and Sustainable Development,"* twice a year, in coordination with the Mexican, National Secretary of Environment and Natural Resource

One way Tec is working to implement this element of its SD program is through a new, Academic Chair on SD. This special chair is not filled by one faculty member but rather, is filled each year for a period of time by one or two special guest speakers in a keynote conference series. This is called the:

CÁTEDRA DE CONSERVACIÓN Y DESARROLLO SOSTENIBLE (KEYNOTE CONFERENCES IN CONSERVATION AND SUSTAINABLE DEVELOPMENT)

Monterrey Tec and the Ministry for Environment and Natural Resources agreed to create jointly the "Cátedra en Conservación y Desarrollo Sostenible" (Keynote Conferences in Conservation and Sustainable Development). Which is a collaboration effort between both institutions to foster consciousness and interest in species conservation, as well as sustainable development.

The "Cátedra" consists of:

Keynote Conference

A Keynote Conference will be held each semester, with high level Orators, according to themes relevant to Conservation and SD. The conferences will be attended by people on the Tec campus and will also be broadcast via the Virtual University system to all of Tec's campuses and to diverse international sites.

Preparatory Course

In conjunction with each of the special speakers, there will be a special preparatory course to provide students the opportunity to gain special understanding to the content area of the selected, academic leader. This special course will be comprised of three, 90-minute sessions that will be transmitted through the Virtual University. They will be addressed to Students and Educators. Students will be able to earn credits toward their graduation by taking these courses. Also, they will have curriculum value for the professors within their PCP (Professors Training Program).

Contest

With each speaker, there will also be a contest that recognises student team creativity, regarding sustainability. An Academic Council will define the contest rules and the evaluation criteria.

Discussion

The urgency for educators, lead the transition to sustainable societies is underscored by numerous signs of the human population exceeding the eco-system's limits in the ways we are currently living.

In nations, throughout the world, we see that educational efforts are receiving smaller and smaller proportions of the societal support. This is occurring at a time when much more should be invested! A 1930 quote from Derek Bok, then President of Harvard University underscores the need as follows: "If you think education is expensive, try ignorance!"

Unfortunately, far too many of the world's people are illiterate or are ignorant of the impacts of their individual and collective actions are having upon the ability of their children's children's children to fulfil their needs.

Hopefully, the SD program at Tec and at universities and colleges, around the world, will provide the leadership so that present and future generations will make policies, products and practices that will ensure sustainable human existence upon planet earth.

Tec's SD program is now in its infancy, but fortunately; visionary leadership from many among the administration, faculty and students supports it. The information included in this paper, focuses upon the work done at the central campus in Monterrey. Much more work in all six areas is needed and is being planned. As Tec's SD tools and experiences are improved, the scholars at the other campuses in the Tec network will also be engaged.

The authors of this paper anticipate that the six key elements of Tec's SD program will be catalytic in supporting Tec's efforts to help Latin American societies make the transition to *sustainable development*. We hope to learn from the feedback and experiences of other educators throughout the world, as we continue on the SD journey.

Literature

Some useful web addresses for educators working to promote SD.

The International Association of Universities
Main Declarations, Charters, and Action plans
http://www.unesco.org/iau/tfsd_first.html

The Talloires Declaration of 1990:
(http://www.ulsf.org/about/tallo.html

The Halifax Declaration of 1991:
(http://www.unesco.org/iau/fre/tfsd_halifax.html**,**

The Swansea Declaration of August 1993: (http://www.unesco.org/iau/tfsd_swansea.html)

The Kyoto Declaration of November 1993:
(http://www.unesco.org/iau/tfsd_first.html#THE%20KYOTO

Copernicus Charter. The University Network for Sustainability
http://www.copernicus-campus.org/

Alliance for Global Sustainability.
International partnership of Universities.
http://globalsustainability.org/

Center for Sustainable Systems (Changing towards Sustainability)
The University of Michigan
http://css.snre.umich.edu/

Envirolink Network. The Online Environmental Community.

http://envirolink.netforchange.com/

The Lewis Center for Environmental Studies in Oberlin College.
http://www.oberlin.edu/envs/ajlc/

National Wildlife Federation.

Environmental Education
http://www.nwf.org/education/index.html

Sustainable Development on Campus.
International Institute for Sustainable Development.
http://iisd1.iisd.ca/educate/

United Nations Sustainable Development
Agenda 21, Forests, National Information, etc.
http://www.un.org/esa/sustdev/

United Nations Industrial Development Organization.
The Three Dimensions: Defining sustainable development
http://www.unido.org/doc/50367.htmls

University Leaders for a Sustainable Future.

http://www.ulsf.org/

University of British Columbia Campus Sustainability Office
http://www.sustain.ubc.ca

Education for Sustainable Development Toolkit, Version 2, July 2002 by Rosalyn McKeown

http://www.esdtoolkit.org/

Return to contents

Papers and Stories of Transformation

---

1. An Educational Consortium Produces Environmental Transformation

Dr. Wayne Anderson,

Associated Colleges of the South, USA.

Dr. Wayne Anderson
President of the Associated Colleges of the South
(president of the consortium since it was incorporated ten years ago)

Associated Colleges of the South
1975 Century Boulevard, Suite 10
Atlanta, GA 30345 USA
404-636-9533 (office)
404-636-9553 (fax)
e-mail: wanders@colleges.org
website: http://www.colleges.org

Transformation is the story of the environmental initiative launched by the Associated Colleges of the South in 1997. The initiative was and continues to be a central thrust of the Associated Colleges of the South, a ten-year-old consortium of national liberal arts colleges and universities located in an area in the U.S. extending from Virginia to Texas (a list of member institutions is attached). The consortium is an exceptionally active and comprehensive coalition of institutions working together to enhance educational programs, increase administrative efficiency and effectiveness and provide an array of services to member institutions. In all of its undertakings, students are viewed as the ultimate beneficiary. Its environmental initiative has been particularly captivating because of the widespread interest among faculty, students and staff, because of the potential to effect systemic change on the campuses and because of the possibility of advancing the cause of sustainable development in the world at large.

This new ACS focus has emerged from the colleges and universities themselves - out of the need and desires identified by individuals and groups on each of the member campuses. Before 1997, faculty of the campuses were teaching environmental classes; students were taking part in environmental activities; and staff were thinking about the environmental impact of new buildings. Considerable research on environmental topics was also being conducted. What was missing was collaboration transcending institutional boundaries. This is where the ACS stepped in.

Beginning five years ago, the consortium identified and brought together faculty, in particular, who were interested in the environment. The consortium hoped, at least, to produce lively and engaging conversations, exchanges of information, and a consensus among participants to keep the dialogue going. Much more has happened. The dialogue spawned a myriad of projects, linking together faculty, students and staff from all 16 member institutions. Considerable progress has occurred over these five years and we are very sanguine about the years remaining in our current plan. Furthermore, plans are being assembled for another phase of the effort, beginning in the 2005-2006 academic year. A splendid grant of $1, 695,000 from the V. Kann Rasmussen Foundation supported the program during its first years and the same foundation has provided further substantial funding. A matching grant was made by The Andrew W. Mellon Foundation and funds have also been provided from the ACS institutions.

The first hypothesis tested by the group was that the consortium could assemble a comprehensive and stable network for the joint environmental initiatives it wished to pursue. This hypothesis has been affirmed. ACS has been able to create a wide range of committees, task forces and alliances that have effectively created, overseen and evaluated the project. The institutional presidents and the chief academic officers have provided overall guidance and made the final decisions on actions to be taken. A widely representative program committee has conducted the overall efforts and shaped plans for the future. Working with this program or coordinating committee have been the leaders and participants in the various individual environmental projects.

Six alliances have been put in place, and each one is dealing with a different aspect of the environment. Each one is comprised of representatives of ACS colleges and universities. Furthermore, we have selected student interns, faculty fellows and staff fellows on the campuses, each working in his or her area to advance the environmental cause. Throughout this organization, an excellent balance has been maintained, retaining experienced participants in the effort while bringing in new blood each year. Furthermore, this effort is strongly supported by an able staff led by Dr. Elizabeth MacNabb (emacnabb@richmond.edu). Also available are the other resources of the consortium, including staff in international programs and staff who manage the ACS Technology Center.

There are many reasons why ACS has been able to establish a solid network. First, the institutions were familiar with working together and had successfully created many other networks. Since those other networks had been extremely productive, environmental leaders felt that they had dependable models to emulate. A collegial spirit also prevailed, and faculty and staff who were very anxious to get things done saw collaboration as a vehicle through which a great deal could be accomplished. Early participants in the effort also saw a unique opportunity to create an innovative organizational model for meeting ambitious environmental goals, thereby maximizing their impact and promoting sustainable development on a broad scale.

The second hypothesis advanced by the group was that the cooperative network established by the consortium could achieve significant results in terms of enhancing environmental citizenship and leadership. In general, this hypothesis has also been affirmed, and following are numerous examples of what has taken place. Much more, however, must be accomplished -- there is no complacency among consortium leaders as they face the daunting environmental challenges that confront the society at large.

First, let me describe activities in the Student Development and Engagement Alliance. As a result of strong leadership from the alliance, and the diligent efforts of student interns on every campus, ACS has conducted numerous activities. The initial focus was on workshops, as a means of bringing people together to identify issues and forge plans to deal with those issues. Among the workshops were a conference entitled "Greening the Campus and Broadening the Classroom," training sessions for interns, a sustainable campus development clinic and a second, follow-up sustainable campus development clinic. Interns also joined faculty fellows in a Fall, 2001 workshop designed to identify their respective roles, determine how they could collaborate in effecting environmental change on the campuses and plan specific action projects. All of the various opportunities have been designed to prepare participants to take constructive action, and such actions have occurred.

Environmental assessment has been one of many student-driven activities. Learning from one another, students have developed comprehensive assessment processes and techniques, through which they have helped the institutions to identify the current state of campus environmental policy and action, leading to proposals for improvement. This process has been a singularly valuable experience for the students involved, while also serving the institutions. In addition to raising the general awareness of environmental concerns, students have played key roles in recycling, energy conservation, alternative transportation, eco-housing and other areas. They have also been a centerpiece of the effort to reach out to surrounding communities, particularly in increasing environmental awareness in secondary schools.

One of our college presidents remarked that student activism and leadership on his campus had not only helped to change the institution, it had significantly influenced him in a personal way, causing him to be a more responsible steward of the environment.

A second group, the Curriculum and Faculty Development Alliance, has also organized workshops to share information and explore cooperative efforts. Workshops have focussed on the role of liberal arts colleges in developing environmental citizenship, looking at the specific possibilities of enhancing the curriculum. Faculty development workshops have been offered with these titles: "watershed laboratories for education and research," "sustainable development in local communities," "broadening the classroom" and a "geographical information system boot camp."

While faculty have made new contacts, exchanged syllabi and reviewed and tested new substantive and pedagogical approaches to environmental studies, various institutional changes have occurred. The number of ACS institutions offering environmental studies majors or concentrations, has increased from three to twelve. Enrollments in these major or concentrations has risen from 69 to 167 students and the number of courses having an environmental focus has grown from 202 to 234. Seventy new courses have been put in place, and many courses have been refined. These courses cover 13 academic disciplines, it should be noted, and significant interdisciplinary activity is taking place.

Particularly active has been our third group, the Alliance for Sustainable Development in the Global Community. The faculty in this alliance have initiated and extended a number of overseas programs. For example, students have been provided an opportunity to study in Costa

Rica focussing on sustainable development, with Spanish also being offered. As students vis it various parts of the country, they approach the sustainability topic from a variety of academic disciplines. A second program, also offered in the summer, takes place in the Yucatan in Mexico, where students take a field-based research course. They focus on the Mayan culture, tropical deciduous ecology and the impact of tourism on the marine environment and sea turtle habitat. Students and faculty have gone to the Dominican Republic, focussing specifically on water-related issues. In Honduras, a serv ice learning effort has involved various efforts to improve the local environment. In addition, the consortium hopes to identify additional potential partners from other parts of the world, including South Africa. Conversations have begun with a higher education consortium in South Africa with an eye toward collaboration in curriculum development, faculty exchanges, student exchanges and joint research.

The alliance has also promoted the exchange of information among the campuses and offered a workshop in the Spring of 2002. At the workshop, participants reviewed a number of ways in which the environment and sustainability could become a focal point of current international courses. International program directors were challenged to think of the ways in which the environment could also be incorporated into the off-campus experiences made available to their students.

Considerable importance has been attached to this particular alliance because of the global nature of environmental issues. ACS faculty recognize that the lessons learned from the study of water quality in South Carolina river basins may be applied elsewhere in the world. Meanwhile, studies of clean-air issues overseas may be applicable to the communities in which our colleges and universities are located. In more fully understanding how literature treats the environment, it is essential to look at the literature of many cultures. The study of world religions is necessary if one is to gain a comprehensive sense of the spiritual approach es to the subject of sustainability.

A fourth alliance has focussed on spirituality and sustainability and draws on multiple religions and world views. Faculty and students have traveled to Assisi, Italy to gain heightened understanding of a Christian and Catholic view related to the stewardship of the earth. As part of a "Southwest Pilgrimage," they have also traveled to a Native American setting, in the process experiencing how different Native American traditions use stories and ceremonies to establish and maintain harmony with nature, protect their health and lead meaningful lives. Further courses and pilgrimages are planned in relation to other spiritual and cultural traditions.

In this undertaking, the ACS has reached out to other groups, particularly Heifer Project International, the Center for Respect of Life and Environment (CRLE), and other organizations. In this way, the group has broadened the circles of experts on whom it can draw to organize, develop and offer exciting and valuable academic experiences for students.

Our fifth cluster of institutions is the Campus as a Laboratory for Sustainability Alliance. Like the others, it has been extremely active. Environmental audits, mentioned earlier, have provided a solid foundation for a multitude of on-campus efforts. Energy conservation has been an important objective, with numerous challenge grants provided to the campuses. The various energy initiatives have drawn lessons from a major past effort in which the consortium made an extensive energy audit of one of the campuses -- Rollins College -- carefully analyzing the

buildings on that campus. Expert consultants reviewed energy use at Rollins and developed a plan for energy conservation containing numerous recommendations. Physical plant officials from the other ACS institutions were invited to learn from the Rollins experience, visiting the campus and conferring with the consultants and Rollins staff. Rollins made numerous adjustments as consequence of the study, cutting its annual energy cost by about $250,000. Other institutions were stimulated by the Rollins experience and pursued energy plans and activities in their own settings.

In terms of new buildings and renovations, ACS institutions have become quite sensitive to environmental implications -- so much so, in fact, that many are following the process for Leadership in Energy and Environmental Design (LEED) certification. Furman University is building explicitly along the LEED guidelines and many others are keeping these guidelines uppermost in their minds. In taking these actions, the institutions are attempting to meet the goals of the LEED program, namely, to build exemplary green buildings and inspire others to follow suit.

Environmental design has also become increasingly important on the campuses. Discussions have been held and plans prepared for new college and university landscaping that makes sense from an ecological viewpoint. Gardens have been designed and eco-scapes developed, with colleges drawing especially on the extensive eco-scape in place on the Birmingham-Southern campus.

The sixth ACS group is the Alliance for Campus-Community Partnerships. Alliance representatives have shared information on their own community linkages, learning from one another in the process. They have begun to identify the common issues, problems and challenges they face as they collaborate with their communities. Specific models for collaboration have been shared -- for example, Birmingham-Southern College's work with secondary schools in Birmingham, Alabama, providing considerable environmental education. Another model for partnership is offered by Rhodes College in Memphis, Tennessee, which has an on-going partnership with its adjacent neighborhood. In fact, the college helped to establish a community corporation, which has cleaned a nearby stream and erected attractive housing facilities. What has been particularly exciting about this endeavor has been the active participation of students, with many playing important leadership roles.

The consortium continues to increase the number of community partnerships and expand the circle of partners. Partners are being sought from schools, corporations, foundations and a variety of environmental organizations. Once again, the group is concentrating on forging networks, exchanging information, developing joint environmental strategies and solving real problems. Throughout these efforts, students are involved, for example, in assisting in park management, teaching environmental education courses for elementary school teachers, preparing a report on an alternative site for an environmental protection area, reporting on the physical and biological impact of land use and agricultural practices, and analyzing and making recommendations on forest composition (generating a number of student publications in the process).

Hypothesis three is that the ACS initiative can be widely disseminated and replicated. The jury is still out in terms of this hypothesis, although considerable progress has been made.

Reports emanating from the consortium have been circulated to numerous outside groups including environmental organizations, corporations, foundations, other educational organizations and government. Individuals from these groups have been invited to participate in ACS workshops and its planning activities. Not surprisingly, the specific ACS-community partnerships have provided the most effective means of directly communicating with the society outside of the consortium.

Faculty and staff have presented reports and discussed the ACS initiative at their professional meetings and conferences. Approximately 20 colleges and universities -- outside of ACS -- were invited to take part in the consortium's conference on "Gendered Environments - The Fourth Biennial ACS Women's Studies Conference," drawing on their ideas and supplying them with a clear insight into the aims and activities of the ACS environmental initiative. Numerous institutions outside the consortium have also learned about the program by taking part in the clinic on greening the campus, the workshop on developing an environmental curriculum, and other events. ACS has also invited others to learn about its environmental program by visiting the ACS web site (www.colleges.org).

The consortium has also communicated with the following groups, which have been especially helpful: Second Nature, the Center for Respect of Life and Environment (CRLE) , University Leaders for a Sustainable Future (ULSF), and the National Wildlife Federation. Various groups are seriously reviewing how the ACS initiative might apply to them. Having said that, it is too early to know the extent to which our programs will be replicated.

Hypothesis four is that the program can be sustained. We are already seeing evidence that this is likely to be the case, but perhaps not in all respects. Individual institutions have made their own in-kind and cash contributions to solidify the environmental program on their campuses. Considerable time of faculty and staff, for example, has been dedicated to the project, along with space, supplies, equipment and other contributions. Furthermore, the institutions have contributed funds for consulting, travel to environmental meetings, student work-study opportunities, and the creation of new courses. Looking to extend their efforts, they have also attracted numerous grants to support their environmental initiatives. The colleges and universities have raised over a half a million dollars in the last few years alone for this purpose.

Like the individual institutions, it should be noted, the consortium itself is sharing substantial costs, providing funds and seeking additional support to perpetuate the program -- with encouraging results so far.

As the consortium has conducted its program -- testing important hypotheses along the way -- it has learned a number of important lessons. They include an awareness that dealing with severe environmental problems and doing so cooperatively is extremely difficult; that a consortial effort can be successful; that a diverse group of program leaders is essential; that these leaders must be flexible in responding to environmental challenges; that careful documentation, evaluation and feedback are critical; that on-going and extensive communication is vital within the consortium and with the outside world; that students can play particularly useful roles; that faculty and staff fellows can serve as vital catalysts; and that leadership and support from the presidents and chief academic officers is mandatory.

As ACS continues its efforts, and builds on the momentum its has generated, it looks forward to collaborating with and learning from others around the world who are engaged in the laudable effort of advancing sustainable development.

(emsu paper) 5/31/02 -4

Associated Colleges of the South
Member Institutions

Birmingham-Southern College	Birmingham, Alabama
Centenary College of Louisiana	Shreveport, Louisiana
Centre College	Danville, Kentucky
Davidson College	Davidson, North Carolina
Furman University	Greenville, South Carolina
Hendrix College	Conway, Arkansas
Millsaps College	Jackson, Mississippi
Morehouse College	Atlanta, Georgia
Rhodes College	Memphis, Tennessee
Rollins College	Winter Park, Florida
Southwestern University	Georgetown, Texas
Spelman College	Atlanta, Georgia
Trinity University	San Antonio, Texas
University of Richmond	Richmond, Virginia
University of the South	Sewanee, Tennessee
Washington and Lee University	Lexington, Virginia

Return to Contents

2. Integrating sustainable development into a university curriculum with emphasis on content, value education and reflection.

Geertje Appel
Vrije Universiteit, Amsterdam, the Netherlands

Abstract
Almost 5 years ago the Vrije Universiteit started a programme on "Integrating sustainable development into the university curricula".
This programme aims to enrich scientific education with knowledge, insight and explicit (moral) values with aspirations for sustainable development. It is linked to another programme of the Vrije Universiteit, called "On Values" which aims to promote communication on issues of moral values.

During the first years we worked on pilot studies with a dilemma oriented learning model. Our focus is to implement sustainable development as an obvious "broad academic knowledge" issue into the bachelor education programmes.

Our activities are concentrated on collaboration with disciplinary lecturers and professors from several disciplines: Biology, Chemistry, Social sciences, Economics, Law and the Institute for Teacher Education. This collaboration resulted in education materials with a strong focus on incorporation of sustainable development issues into the regular course content of disciplines. Working on case studies students are confronted with choices, dilemmas and moral values and reflection concerning sustainable development. In some courses there is an emphasis on project work and a multidisciplinary approach.

Keywords: Sustainable development, curriculum design, Integration/change approach in complex organization, content development, value education

Integrating sustainable development into a university curriculum with emphasis on content, value education and reflection.

Introduction: a first orientation on sustainable development

Why do we want to integrate sustainable development into the university curriculum? And if so, what is the best way to integrate sustainable development and how to organize this? During a Sustainable development workshop with faculty management, lecturers and the university board in 1997 the attendants agreed to start off with a Sustainable development programme. The outcomes of the workshop in general showed commitment and agreement on the role universities have in an awareness process for the issue of sustainability and the interest of sustainable development for both lecturers and students was subscribed.

By launching the sustainable development programme in 1998 the workshop tasks, responsibilities (co-ordinator, advice committee) and funding was formulated in a long-term programme document. The outcomes of the workshop are reflected in the aims of the programme. One of the outcomes focused on a preference for integration of sustainable development into the regular education programmes and a preference for a strong link with the disciplinary content.

The aims of the programme direct both, lecturers and students and regard to scientific knowledge concerning sustainable development; insights in opposite interests in situations of sustainable development; awareness of (moral) values (future generations, responsibility, equity, freedom, etc.) philosophical reflection on knowledge and in sights and translate outcomes to decision processes in situations of both individual and collective action. Starting point is sustainability itself as a value. The concept of sustainable development itself reflects on value conflicts behind situations wh ich stress social, ecological and economical aspects and interests. Heidi Muijen will present the philosophical conditions for both programmes as an organizational instrument for curriculum development.

The Sustainable development programme started in cooperation with the "On values" programme, which also aims curriculum development, value communication, critical attitude and reflection. Both programmes express the tradition of the Vrije Universiteit: (social) responsibility, engagement and sustainable development as distinctive corporate characteristics, which are expressed in our mission statement. A management strategy which incorporates sustainable development as a strategic aim may be considered as an excellent condition to start a process for integrating sustainable development issues with an accent on value communication in the regular curricula. Especially the support of the executive board may be considered as a crucial condition to be successful in a process of integrating sustainable development.

Implementation of the programme

At the moment of launching the sustainable development programme, we realized that, beside a first orientation on the concept sustainable development itself at central level a further orientation on the implementation strategy was desirable. To work in the programme successfully we had to obtain insights in processes and understand the organizational context we work in: a complex and highly democratic and decentralized organized university organization.
From the beginning the strategy endeavoured a right mix of bottom up and top down both at faculty level and central level. Furthermore we follow the path of the already existing (formal) structure: contacts with faculty board, faculty management, curriculum committees and other consultative bodies. During meetings with faculty board and management we try to get Sustainable development on the agenda. Often the next step is a presentation of the programme during a meeting of the curriculum committee's and other formal or informal meetings with managers and lecturers. Main objective of this presentations is to get support of executives of departments and institutes (professors) and lecturers. Support of faculty boards and lecturers is crucial in the whole process. A faculty management with a revealing commitment towards the programme turns out to be the decisive factor during this phase of the process.

An important component of our approach was to start of with examples of good practice: pilot studies on sustainable development. We developed such initiatives at random and spontaneous with the involved lecturers. Beside the spontaneous collaborations another kind of initiatives can be distinguished. These are based on the idea of a "structured integration" model in the bachelor programmes.
Initiatives for such were developed and will be described in the next paragraph.

Besides the common patterns of change which take place in a university organization (and which we have to take in account) major processes of change in systems and structure can overrule them. Meeting European agreements, a major reconstruction of the learning programmes take place at the Dutch universities. At the moment all faculties at our university are changing the structure of their education programmes into a Bachelor Master system. For some faculties this operation is an opportunity to restructure the whole curriculum, including the content of the courses.
Developing new, broadened, bachelor programmes, offers major opportunities to integrate aspects of sustainable development. Such "natural" moments offer opportune moments for a structured integration in all the years of a curriculum.

During the integration process we experienced every faculty has his own culture. Therefore different approaches and processes are needed. Just copy one approach or process from one faculty to another would not be a successful strategy. There is not such a thing as the most successful approach. Only the right mix of components will work out well.

Content orientation and didactic approach

As mentioned in the aims of the programme, we choose for integration in the disciplinary content. Therefore we made sure during every step in the process we had commitment of the specialists in the field, the professors and lecturers.
Only they have an overview of their disciplinary field and are able to pin point on disciplinary contributions, make suggestions and can offer to adapt sustainable issues in their courses.
Concerning disciplinary content a process of a more specific disciplinary orientation within the disciplines started during disciplinary meetings with the professionals. The opportunities a discipline can offer were explored with a focus on integration in the compulsory courses.
Beside the orientations on disciplinary content we did at our university, we also collaborated in a national project in developing disciplinary reviews on sustainable development. At the Faculty of Economics an extensive disciplinary orientation on the content was done. Two reviews were executed: one review full off suggestions and examples for first year courses was done by two professors. The other review concerned a publication on Economics and sustainable development.
From a didactical point of view a cross-reference of sustainable development issues in the content of the regular courses in the curriculum is of great importance. Therefore one of our approaches, structural integration, is concentrated on integration of sustainable development as "a red thread" in the bachelor and master programmes.

Parallel with the pilot study approach and the structural integration approach we work on the development of a didactic instrument: Dilemma Oriented Learning Model. Working with this

instrument students are confronted with assignments which content a realistic dilemma in the field of sustainable development. During four phases they have to choose a course of action or bring out an advice. They have to choose intuitively, based on (multi)disciplinary knowledge, based on knowledge from a philosophical perspective and finally a reflection on the learning process. Beside arguments based on knowledge they have to discuss their choices, attitudes, (moral) value sets and philosophical reflection behind their choices. Rob Boschhuizen will present the outcomes of learning processes of the dilemma oriented model.

Till so far we worked together in projects with the discipline of Biology and Biomedical science (Faculty of Earth and live Sciences), Faculty of Social Studies, Chemistry, Faculty of Economics and Business administration, Faculty of Law and the Institute of teacher education.
The initiatives in the Biology and Biomedical sciences Bachelor programme show an example of a Structural integration of sustainable development in a Bachelor curriculum. During the first year student are confronted with dilemmas on the issue of bio technology in an introduction course. In the second year course Molecular Biology, students have to make a decision about biotechnology food and biotechnology experiments.
In a third year compulsory course the history and different visions of the concept of sustainable development and complexity of sustainable development issues is brought in. Food security is the central dilemma in this course. This theme is elaborated in issues such as water management, international affairs, economics and rainforest. The final plenary session is a panel discussion with experts in the field of food security and ethics.

Another example of integration shows a first year course Accounting at the Faculty of Economic science. Investment decisions of a Dutch brewery and a textile company form the central dilemmas in this course. Based on the outcome of investment model calculations student have to decide to invest in a wastewater treat plant. With the next assignment of the case the students are asked to analyse Internet information of the World Business Council for Sustainable, the Environmental report of European breweries and an article about the Triple P concept. Besides financial facts (the outcome of calculations) the students are now confronted with other sustainable development information: the importance of scarce fresh water for a brewery as an ingredient and for the production process, Eco-efficiency, what is good for the enterprise in terms of moral values, short-term long term effects, civil society and social responsibility and sustainable enterprise. At last the students again have to decide about the investment of the wastewater treat plant. When we asked the students why it is a responsible investment they mentioned arguments such as: social responsibility, sustainable enterprise, the environment, sustainability policy and future/long term positive effects.

The third example concerns a case in a first year course in the Chemistry curriculum. We developed a case for the course “Chemistry and society” in a team with the lecturer and an educationalist. Student has to give an advice about the risks of damage of endocrine disrupters to the environment. They have to take in account the great deal of uncertainties and they have to discuss and reflect on the precautionary principle and decide if precautionary action has to be taken.

The examples of curriculum development in the chemistry an economics curriculum show at random pilot studies on integration of sustainable development. These examples of good practice might offer possibilities for integration in the bachelor programme. The example of the Biology

and Biomedical science (Faculty of Earth and live Sciences) shows a first attempt of Structural integration: pilot studies where developed for all three years of the bachelor curriculum. This resulted in three courses, the first, second a third year, with an integration of sustainable development aspects: a first “red thread” of sustainable development in a bachelor programme. This type of structural integration can be defined as partial structural integration in a curriculum.

The Bachelor Master reconstruction seems to offer possibilities for integration of sustainable development. The faculty board of two large faculties, the Faculty of Social Studies and the Faculty of Economic science invites us, to make suggestions for the integration of both programmes On values and Sustainable development according to their Bachelor reconstruction plans. This kind of invitations offers an excellent opportunity to develop curricula and to focus at a complete structural integration. We are working now on a model for a complete structural integration with lecturers of the Faculty of Social Studies by analysing the content of the courses and making suggestions for the most obvious courses. Sustainable development can be integrated as “a red thread” in the bachelor and master programmes aiming education of students to become (social) responsible professionals with a critical attitude in general and towards sustainable development in a complex society.

Return to Contents

3. Environmental Management at Swedish Universities

Karin Arvidsson

University of Gävle, Sweden

Karin Arvidsson
Department of Industrial Engineering and Management
University of Gävle
S-801 76 Gävle
Sweden

Telephone: +46 (0)26 648801
E-mail: kas@hig.se

Background
In 1996 the Swedish government decided that public authorities should act as role models in contributing to the long-term sustainable development of society (Ministry of the Environment, 2002). The public authorities should use environmental management systems (EMS) to work towards this goal although no certification is required.

Since almost all Swedish universities are publicly owned they are also part of the project and thus required to write environmental reports every year. These reports are sent to the Swedish Environmental Protection Agency and to the National Agency for Higher Education. The first year, 1997, only two universities participated. The following years the number of participators increased and in 2001 all educational institutions in Sweden were required to implement environmental management systems.

This study provides a review of the activities at the Swedish universities so far, according to their own environmental reports dated 2000 and 2001.

In 2000, 25 universities were obliged to report on their environmental work. All of them did, but some reported very late. In 2001, all the educational institutions in Sweden, 35 all together, were obliged to report, but when this study was made in May, 2002, only 25 institutions had reported even though the reports should have been handed in in March. Ten new institutions joined the project last year, but only six of them have reported this far.

Steps in environmental management
How far the environmental planning of the universities has proceeded can be judged from the tasks of the environmental management system they have fulfilled. The table in Appendix I shows what tasks the universities have fulfilled or at least started working on.

Environmental review
The first step when introducing environmental management systems is to make an environmental review. The reports from 2000 show that all of the 25 participating universities have made their first environmental review. Three of them have chosen to start the environmental work at only

one or a few departments. The rest have made their reviews for the whole university. Four out of six of the universities that joined the project in 2001 have made their reviews.

Environmental policy
All the universities that joined the project before 2000 have set environmental policies. Five more universities joined the project that year, one of them set their environmental policy the first year and one submitted a draft. The following year two more of those universities had set their policies and one more had submitted a draft. Among the universities joining the project in 2001 two out of six set their policies during the first year. Some of the universities have chosen their policies according to the ISO 14 001 requirements.

Environmental targets
The reports from 2001 show that two out of five universities that joined the project the year before have set environmental targets. The other four universities have started to work on formulating targets but not yet set them. Among the universities joining in 2001 none has set targets, but one had submitted a draft.

Environmental management program
By 2001 twelve of the universities that joined the project in 2000 and earlier had set up environmental management programs.

Environmental training of employees
According to the governmental decision, all public employees should get a basic environmental education. This is one of the main tasks. Many of the universities have started to offer their staff training programs. The programs are primarily aimed at the university management and the environmental co-ordinators. The way of conducting the training varies. Växjö University, for example, offered all their staff a training program where the first part consisted of basic environmental education, group discussions, and a tour through the campus area. The second part has been started and this part is more directly aimed at environmental management. The university management has also been trained in management of change.

The university of Lund has focused on special training for selected groups; prefects and heads of departments have been trained in delegating responsibilities for environmental and health as well as safety issues. There was one day's instruction in flooring materials and another in environmental issues regarding public purchasing.

Following-up, evaluation and environmental auditing
Only three of the universities, Stockholm, Lund and Mälardalen, have been subjected to environmental auditing; Lund had external auditors. Stockholm was inspected by their environmental co-ordinators who are trained fore internal auditing. Mälardalen conducts internal audits every year. Both Lund and Mälardalen report that the revision work has been of great use for their continued work.

Certification
Some of the universities aim at certification. Today Mälardalen University is certified according to ISO 14 001 and one department of Mid Sweden University is EMAS-registered. The University of Gävle hopes to be certified by early 2004.

Neither Mälardalen nor Mid Sweden University report how the certification has affected the university as a whole.

Driving forces
In the reports from 2000 the universities were expected to report driving forces and obstacles to environmental management work. 19 out of 25 universities did that. More driving forces than obstacles were reported. The most common driving forces are presented below (the numbers in brackets indicate how many universities reported that particular motivating factor):

- Employee commitment (11)
- Student commitment (6)
- The governmental commission (6)
- Management commitment (5)
- Legislation (5)

More than half of the universities point to the employees' commitment as a motivating factor. It is also obvious that the governmental commission is of importance. The same conclusion is reached in the report by the Ministry of the Environment (Ministry of the Environment 2001) dealing with the environmental management work of all the public authorities. The report states that 40% of the authorities are of the opinion that, without the commission from the government, the environmental management work would not have started or at least not have got such a high priority.

It is important also to be conscious of the students' impact on environmental work. Växjö University points out that students that are educated at the university will work during one generation and use their knowledge all the time. Several universities think in the same way. The Stockholm Institute of Education, for example, sees their students' future contact with pupils as a motive force for their environmental work.

Environmental work is also considered important for the marketing of the educational institution. Södertörn University points out that, by offering environmental education and research, they can show great environmental ambitions. But they also point out that ambitions without the capacity to fulfil them might damage the credibility of the whole institution.

External actors interested in the environmental qualifications of the universities or the co-operation within the environmental area with other public authorities, if any, are also important.

Obstacles
The reported obstacles are listed below (the numbers in brackets indicate how many universities reported that particular obstacle):

- Lack of resources, both as regards time and money (7)
- Organisation structure and changes within the organisation (5)
- Legislation concerning public purchase makes it hard to make environmental demands (4)
- Lack of indicators (3)
- Short term economic thinking (3)

At the same time as seven institutions see lack of resources as a great obstacle, one university, the University of Kristianstad, claims to be uncertain about the fact that more economic resources would help since the implementation speed is dependent on the management's and the departments' commitment.

One of the largest universities, the University of Lund, says that the complexity of large organisations tends to slow down all kinds of changes, including the environmental work. Another problem is that other activities often interfere with the education, for example, the activities at the Karolinska hospital interfere with the education at Karolinska institutet, or that the facilities are spread over a large area in a town.

Växjö University points out that the majority of people still see environmental work as the sorting of waste instead of as a long-term sustainable development of society. A contributing factor to this might be the unclear signals from decision makers and governmental authorities. Environmental concern is important but economic growth and short-term thinking most often overshadow the long-term thinking and planning that sustainable development requires. Växjö University also describes the conflicting internal goals within the university.
One example of the difficulties within the academic world is described by the Royal Institute of Technology; the prefix "environment" has become ambiguous and associated with a large number of different phenomena in society and has therefore become an obstacle for the "environmental work" at the institute. The Royal Institute of Technology therefore prefers to use other concepts such as "sustainable development" and "ecological efficiency" in their work.

Environmental aspects
In almost all the universities the work with environmental questions starts with the direct environmental aspects. The direct aspects are often tangible and easier to handle than the indirect ones. However, the greening of the curriculum in the long-run is of greater importance for educational institutions. In the reports from 2000, 20 out of 25 universities describe the importance of integrating environmental perspectives in education. In 13 reports they also mention the environment as an important factor in the research area. Those insights are of great significance and follow the Government objectives (Regeringens skrivelse 1999/2000:13). There are, however, few universities that have incorporated environmental elements in education and research today. In several reports, the importance of possibilities to make assessment of the situation is discussed. Six of the reports from 2000 give information about the numbers of courses containing environmental aspects. What this evaluation is based on is not mentioned.

The University of Umeå has practised a model where they give courses environmental labels. A course has to fulfil at least two out of three different criteria (Umeå University, 2000, p 5):

1. The course should consider the environmental effects of human activity or how the effects affect humans.
2. The course should offer knowledge about how humans and society should handle different environmental problems.
3. The course should consider conditions in nature relevant to environmental science. Those conditions should link clearly to the first two criteria.

The Royal Institute of Technology has counted the numbers of master theses and licentiate and doctoral theses with a clear environmental alignment. The word "clear" is not defined. The

University of Gävle has simply counted the number of course definitions containing the word "environment" or "ecology".

Several universities mention new and old educational programs with different kinds of environmental focus. Some universities strive for at least a five-week environmental course in all educational programs. Integrating environmental thinking in all academic disciplines seems more difficult. Several universities are working with those questions. Some are using inquiry groups and one has employed a teacher to introduce "applied environmental knowledge" in all areas, but this far no one has arrived at a complete solution.

One example of prioritised environmental thinking in research is Chalmers University of Technology. They are going to invest SEK 100 million within three years, mainly to employ seven internationally known environmental professors.

Conclusions

The EMS-work at the Swedish universities is increasing and getting more structured, but the work is progressing quite slowly. Many of the universities work seriously and it seems as if a great interest in environmental issues exists among the staff and the students. There also seems to be an understanding of the great indirect environmental impact caused by education and research among the universities. Some of the universities are working hard with these questions and even turning the environmental commitment into a profile for the whole university.

The results show a tendency that those who have participated in the project for some years have come further in their work than those who joined recently and that EMS-work is easier in small universities than in the larger ones. It seems easier for smaller universities to gather around one goal. The smaller ones might also be keener on developing a profile of their own, for example, an environmental one.

It seems as if the EMS-work has developed faster at the universities that joined the project early. There seems to have been a greater commitment among them; some joined the project early out of free will. The last ones joining have seen the project develop and have realised that they would soon be included; still they were not better prepared. The "art orientated" universities seem less motivated. During their first year, one of them, the Royal University College of Music, made an environmental review and concluded that they are not affecting the environment very much. They have set an environmental policy and now they consider the EMS-work fulfilled and implemented. The college might be right about the fact that they are not effecting the environment very much. Still, this is not a good way of starting environmental work. It does not inspire either staff or students. Even though the effect is quite small, it may still get smaller. There have to be some goals to work towards, even at an academy of music, for example, when travelling between concerts.

The fact that 10 out of 35 did not hand in their reports on time shows that even though many universities are committed to the EMS-work not all are. The study of the reports from 2000 shows that reports handed in too late are often very thin and indicate that the work has not proceeded much since last year.

Finally, this study shows that it is difficult to force the universities into EMS-work. The presented list of driving forces clearly shows the importance of the directive. It definitely gives the environmental work a higher priority.

References

Ministry of the Environment (2002). *Miljöledningssystem i statliga myndigheter – sammanställning av årsrapporter för år 2000.*

Regeringens skrivelse 1999/2000:13, åtgärd U07:6 och U98:1.

Environmental reports from following educational institutions:
Blekinge Institute of Technology, 2001
Chalmers University of Technology, 2000
Dalarna University, 2001
Gotland University College, 2000, 2001
Göteborg University, 2000, 2001
Halmstad University, 2000, 2001
Kalmar University, 2000, 2001
Karlstad University, 2000, 2001
Karolinska Institutet, 2000, 2001
Kristianstad University, 2000, 2001
Linköping University, 2000
Lund University, 2000, 2001
Malmö University, 2000, 2001
Mid Sweden University, 2000
Mälardalen University, 2000, 2001
Royal Institute of Technology, 2000, 2001
Royal University College of Music in Stockholm, 2001
Stockholm Institute of Education, 2000, 2001
Stockholm University, 2000, 2001
Södertörn University College, 2000, 2001
Umeå University, 2000, 2001
University College of Acting in Stockholm, 2001
University College of Arts Craft and Design, 2001
University College of Borås, 2000, 2001
University College of Opera, 2001
University of Gävle, 2000, 2001
University of Skövde, 2000, 2001
University of Trollhättan/Uddevalla, 2000, 2001
Uppsala University, 2000
Växjö University, 2000
Örebro University, 2000, 2001

Table I The table shows how far the environmental planning at the universities have advanced and what tasks they have fulfilled. The information is based upon the universities' environmental reports.

	Start	Environ-mental review	Environ-mental Policy	Environ-mental Targets	Manage-ment programs	Education of Employees	Auditing	Certified
Lund University	1997							
Stockholm University	1997							
Göteborg University	1998							
University of Gävle	1998							
Royal Institute of Technology	1998							
Linköping University	1998							
Mid Sweden University	1998							
Mälardalen University	1998							
Umeå University	1998							
Chalmers University of Technology	1999							
University College of Borås	1999							
Halmstad University	1999							
Kalmar University	1999							
Kristianstad University	1999							
University of Skövde	1999							
Karlstad University	1999							
Karolinska Institutet	1999							
Uppsala University	1999							
Växjö University	1999							
Örebro University	1999							
Gotland University College	2000							
University of Trollhättan/Uddevalla	2000							
Stockholm Institute of Education	2000							
Malmö University	2000							
Södertörn University College	2000							
Blekinge Institute of Technology	2001							
Dalarna University	2001							
University College of Arts Craft and Design	2001							
The Royal University College of Music in Stockholm	2001							
University College of Opera	2001							
University College of Acting in Stockholm	2001							

Think they have conducted this step
Have started to work with this step

Formatted

Return to Contents

4. Broadening, Changing and Confirming processes of Students' Value Learning: Effects of an integrated sustainable development Life Science Course

Dr Rob Boschhuizen,

Vrije Universiteit, Amsterdam, the Netherlands

Dr Rob Boschhuizen
Van Waarden weten groep
Vrije Universiteit
De Boelelaan 1091
Kamer 1H-31
Amsterdam
Tel: +310204449219
E-mail: r.boschhuizen@dienst.vu.nl

1 Introduction

Serving the poor, the community's health, managing the environment and maintaining dignity in the work place are all requirements placed on the leaders of a responsible society, in which people

* can live as people, who live a social life in its plurality;
* recognise their relationship with the earth;
* are aware of their relationships with time, carrying them forward from birth through childhood, adulthood, and to death, and placing themselves between generations.[2]

Students in Higher Education will be the leaders of tomorrow's society. They have to be educated to be critical and responsible scientists, professionals, who make their decisions from these requirements for sustainable development of the world. Therefore, strengthening the students' sense of this societal responsibility and deepening their values and moral conscience in this respect have to be important elements of the pedagogical mission of educational institutes and of Higher Educational institutes in particular. These elements should be integrated in the curricula from the most general curriculum level to concrete syllabi and courses of study.

But although achieving the first step, integration at a general curriculum level, is half the battle won, ensuring actual integration into (multi-)disciplinary courses is another matter. At the Vrije Universiteit of Amsterdam (VU) we try to achieve such integration at the different levels in the curricula from our general curriculum to concrete

[2]. (See: Bob Goudzwaard and Harry de Lange, Beyond Poverty and Affluence. Towards an economy of care, 1995),

disciplinary courses. To take into account current educational practices andthe ideas of the tutors on value learning in academic disciplines we started this integration process with research on the role of moral values in teaching materials in the different faculties. This research was focused on the so-called 'pedagogical moments': the moments during teaching when implicitly scholarly and moral values are at stake. (Boschhuizen, 1999). Pedagogical moments:

* can be used to make such values and underlying assumptions explicit.
* can also serve as opportunities for discussion to clarify, communicate and develop students' values in academic disciplines.
* are prime opportunities for us to devote attention to values in the practice of teaching.

If we were to leave these values implicit and hidden, we would be missing out on an opportunity to confront students with their own values, to stimulate their development of values and to enhance their abilities for critical reflection on disciplinary enterprise. In this study (Boschhuizen and Goudzwaard, 1995) we found that:

A Pedagogical moments occur fairly frequently;
B Such pedagogical moments can be found in three areas of disciplinary knowledge:
    * The area of scientific practice (including such questions as to whether science is value-free or value-loaded, and value aspects of an ethical nature such as modesty in scientific claims and integrity);
    * The area of applied science (including ethical questions and aspects of value such as integrity and sustainable development);
    * The area of more general philosophical, social and religious questions (values such as solidarity and a co-operative attitude).
C Curricula, teaching materials and lectures often lack any systematic measures to exploit pedagogical moments for clarifying, communicating and developing the students' values.
D There is support for efforts to systematically integrate the teaching of values into courses in academic disciplines.

Stimulated by these observations and by the support of professors and other university teachers for systematic integration of value learning in academic disciplines, we developed different tools for integration based on the following pedagogical points of view and competencies (based on Boschhuizen en Noordegraaf, 2000, and Boschhuizen en Brinkman, 2001).

Responsibility and value learning ask for learning environments in which:

1 Knowledge of relevant scientific concepts and skills are essential. Besides, students' own intuitive ideas, such as preconceptions, feelings, attitudes, emotions, and moral values, with respect to their responsibilities play a very important role. Both, intuitive ideas and scientific concepts and skills affect observations, interpretations and decisions. Without paying attention to the relationship between intuitive ideas and scientific knowledge and skills, there is a danger forthe development of two different and isolated worlds: the world of scientific knowledge and skills and the world of intuitions and emotions. In decision-making for example, such a separation could lead to

alienation form the students' personal attitudes, feelings and values on the one hand or to alienation from the Sciences on the other.

Competency: the student is able to relate explicitly his or her intuitive ideas to and in balance with relevant scientific concepts and skills.

By 'in balance' we mean that both the intuitive ideas and the scientific concepts and skills are considered and justified by students. By 'with' we mean that students relate their intuitive ideas (subject) to the relevant scientific concepts and skills (object) and vice versa.

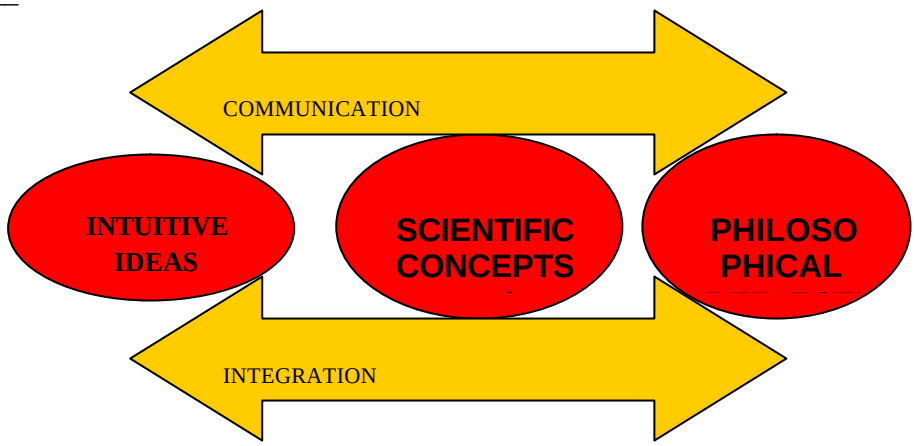
2 The relevant scientific concepts and skills are studied in combination with questions about their degree of truthfulness.
Competency: *the student is able to analyse scientific concepts and skills philosophically*.

3 Students communicate their intuitive ideas and scientific concepts.
Competency: *the student is able to communicate his or her own ideas, concepts and values.*

4 Competency: *the student is able to make choices and is able to justify his or her choices*.
Cases and dilemmas provide the best opportunity for making choices, and exercises in justifying choices. The dilemmas, as referred to here, are difficult situations involving the responsibility of scientists and professionals. The students have to choose between two or more alternatives and must justify their choices. Cases are defined as descriptions of events with respect to sustainability, involving the alternatives at hand.

The main pedagogical aim has been summarized in figure 1.

Figure 1
The main pedagogical aim of the integration of value learning in academic disciplines



One of the tools to support and stimulate professors and other university teachers in developing such learning environments is the Dilemma Oriented Learning Model (DOLM) (Boschhuizen, Appel and Van Straalen, 2000). The model is also based on work by Nachtigal (1984), Driver and Oldham (1985), Hasweh (1986) and further developed by Licht (1988) and Boschhuizen & Brinkman (1991).

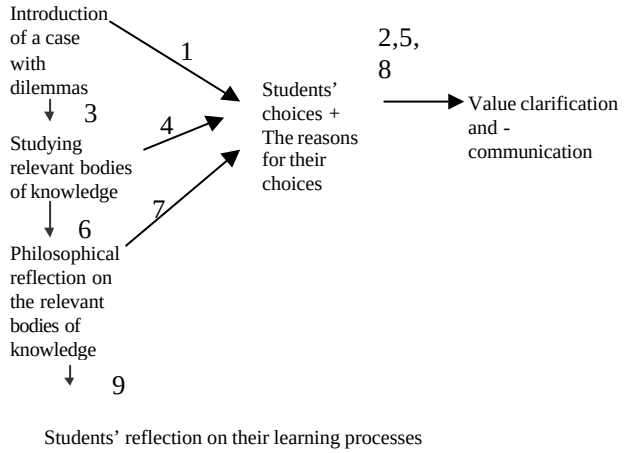
DOLM is a four-phase model (see figure 2).
Phase A - The intuitive phase: The students read a short description of a case study involving dilemmas. They intuitively choose a course of action in this specific situation and formulate the arguments and moral values underlying their choice (1). The students then discuss their choices and values (2).

Phase B - The phase of knowledge acquisition: In the next stage, the students study relevant bodies of knowledge (3). Subsequently, they again make another choice and offer their arguments and an explanation of their values (4). This is followed by a discussion between the students on choices and values (5).

Phase C - The phase of reflection on the relevant bodies of knowledge: In this phase, the students reflect on the truth of the relevant bodies of knowledge from a philosophical perspective (6), after which they make their choices again, present their arguments and clarify their values (7). In this phase too, they discuss their choices and values with each other (8).

Phase D - The phase of reflection on the learning process: The students reflect on the three choices made in the earlier phases and give a verbal description of their learning process (9).

Figure 2 The structure of the DOLM



At the VU professors and other university teachers have developed several (multi-)disciplinary DOLM courses in different ways.
One of these courses is 'Issues of sustainability in the life sciences', written by Marijke C.T. van Lange, Geertje Appel and Nico M. van Straalen[3].

The course was given over a period of four weeks and was structured as follows:
Phase A:

[3] See Marijke C.T. van Langen and Nico M. van Straalen: 'Issues of sustainability in the life sciences. An inside view in the design process of a new multi-disciplinary course on sustainable development at the Vrije Universiteit, Amsterdam', Paper presented at the 5th International Copernicus Conference, Gothenborg 12 - 14 June 2002.

The course started with an introductory lecture about sustainable development, its history and the different views and opinions. Then a case study, 'feeding Abundantia'[4], was introduced. The students were divided into groups. The first task (task 1) was to write an individual advice based on the student's own intuitive ideas.

Phase B:

In the second week, three guest speakers, all experts on the issue food security, were invited. The speakers were members of the Centre for World Food Studies. This research centre provides support at both national and international levels for the formulation of food and agricultural policies and policies aimed at poverty reduction. The guest speakers gave information on the issues of health, trade, economics and agriculture in relation to food security. They also gave more specific information about the different topics related to these issues. The students were given a folder with literature and a list of websites on which they could find more information on the issues discusses. The task for second week (task 2) was to write an advice, collectively as a group, to the President. They had to decide what advise to give to the President concerning the dilemma of their issue and they should also take the new information into account. This phase involved much discussion between the students. They found out that they all had different opinions based upon different personal values. They had to learn to deal with these opinions and they hadto reach a compromise concerning the advice to be given to the President.

Phase C:

In the third week a professor of ethics of the 'Bezinningscentrum" at the VU gave a lecture. The Bezinningscentrum is conducting research on the interactions between religion, ethics and science in contemporary society. The students gained more information about dealing with dilemma's and could improve their advice given in task 3. In the last week the students presented their advice to their fellow students. In a subsequent debate with the other students and a panel of experts from the Centre for World Food Studies and the professor of ethics they defended their advice. Much discussion took place because of the different priorities students had set in their recommendations.

[4] "This case study is about a virtual developing country called Abundantia. The situation in Abundantia is as follows: Abundantia has 50 million people and is poor but is a relatively stable country. President Chakula is head of this virtual country. Abundantia is suffering from a major food crisis due to continuing drought over the past few years. President Chakula wishes to intensify farming in his country to be able to feed his people. He is seeking good sustainable solutions to bring his country to a higher level of development. On the video, President Chakula is debating with different experts and members of international and local organisations as well as with ministries about the question: how to reach stable sustainable food production and food security in Abundantia without damaging the environment of his country? This is the main dilemma of the case study. The students act as scientists of a research institute on poverty studies which has a focus on food security. The students are asked by the President to give advice to solve this major food crisis and on the possible directions in which sustainable solutions can be found." (Van Langen en van Straalen, 2002).

Phase D:

The last task was about the reflection of the learning process. The students were asked to look back upon their learning process and if they changed their opinion or choices in the dilemma and for what reason they changed it.

One of the aims of the course was that students should learn about their own moral values behind the choices they made in the dilemma. In this paper we discuss two research questions Firstly:

1. Which values are clarified and communicate during the course?

Another important question arises, whether the design of this course contributes to the development of students' values. In research on value development of second year biology students and second year economics students, using a similar kind of course we found three types of learning process (Boschhuizen, 2000, Boschhuizen and Kee, 2001): confirming, broadening, and changing.

The *process of confirming* occurs when something confirms in the beliefs, opinions and intentions of students. This process can make such a belief, opinion or intention stronger.
The *process of broadening* occurs when a student adopts alternative values but the initial values remain dominant.
The process of changing occurs when a student changes his or her initial values to alternative ones.

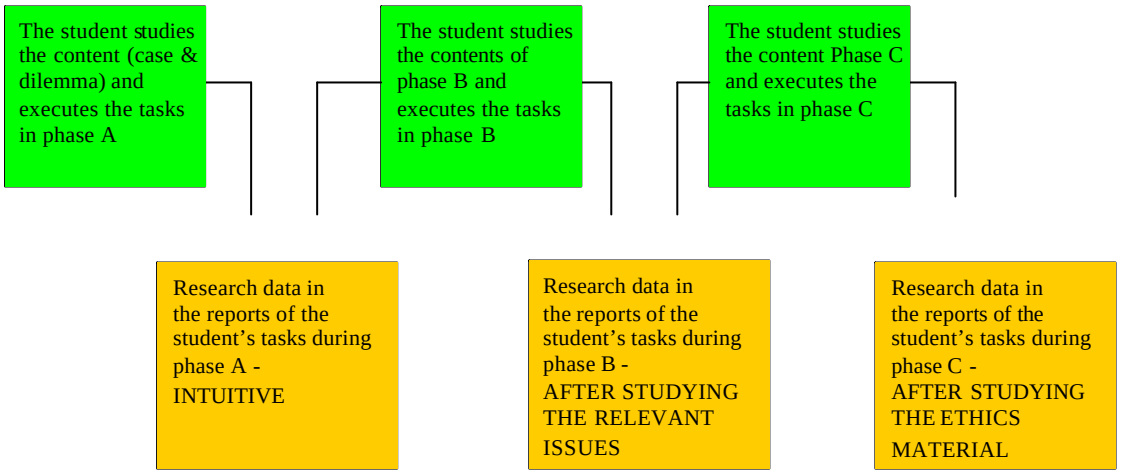
The second research question we discuss in this paper is:

2. Can we distinguish the same kind of learning processes in the biology students during the course 'Issues of sustainability in the life sciences' and what is the relationship between these learning processes and the sustainability issues?

2 The research method

In total, 80 third-year biology students at the VU in Amsterdam attended the course as described above. To answer the research questions we analysed the responses made by these students to the three tasks executed in phases A, B and C, using the research structure in figure 3.

Figure 3 Research structure



Results

We will discuss the results during the paper presentation with the participants in an interactive way.

Return to Contents

5. Sustainable Community Landscapes

Linda Chalker-Scott and Angela Cahill,

Center for Urban Horticulture, University of Washington, USA

Linda Chalker-Scott
Center for Urban Horticulture
Box 354115
Seattle, WA, 98195-4115
USA
Phone: (206) 685-2595
FAX: (206) 685-2595
Email: lindacs@u.washington.edu

Abstract:

Faculty and students at the University of Washington have combined environmental horticulture with service learning to create a transdisciplinary landscape restoration program that involves higher education, K-12, governmental agencies, non-profit groups, and community volunteers. University seniors and graduate students majoring in the plant sciences, landscape architecture, and urban planning work with community clients to restore ecological function to public greenspaces. Once sites and client groups are identified, university students perform a thorough site analysis to identify abiotic and biotic constraints. With active participation from community partners, students then create site plans, incorporating landscape plant selection and management criteria with an aesthetically pleasing, sustainable design. At the end of the academic quarter, students hold a poster session to which community partners are invited to view and discuss proposed designs. A complete project report, including a five-year management plan, is presented to the community partners who have pledged to continue sustainable management for at least five years. Community clients may then ask for assistance in installing the new landscape and learning appropriate site management techniques. Students who have previously participated in the site planning phase learn field skills from faculty and professional staff and then work with community volunteers to implement site plans. Through this series of service-learning courses, students from diverse backgrounds function as a team to improve environmental sustainability of human-altered landscapes and increase integration of university programs with the surrounding community.

Keywords :
Landscape plant management
Restoration
Service learning
Sustainable landscapes
Transdisciplinary education

The program begins

The Sustainable Community Landscapes (SCL) program housed at the Center for Urban Horticulture (CUH) at the University of Washington (UW) evolved as a result of an innovative university capstone course project in 1999. For this course project, we were seeking a transdisciplinary service-learning project for horticulture and landscape architecture students in our revitalized Landscape Plant Management and Selection classes. Through discussions with colleagues, we discovered that Seattle's Garfield High School, an urban public school, was looking for an opportunity to improve the safety, sustainability, and aesthetics of the school's landscaping. Several faculty at the high school were interested in involving their students in designing, implementing, and maintaining a more sustainable landscape. We decided to collaborate with the high school students and parent volunteers by having our students lead a landscape rehabilitation project. The main goal of this project was to teach participants about the complex, interdisciplinary process of creating healthy ecosystems that sustain plants, people, and other organisms. While UW students learn about environmental sustainability in many courses, they rarely have the opportunity to apply this knowledge until they begin their careers. We hoped our students would gain practical skills in plant selection and management, including site analysis, site preparation, and plant selection, installation, and maintenance. Furthermore, our students would be exposed to the real-life constraints in working with governmental, educational, and business organizations. The Garfield faculty and parents hoped their students would learn similar skills by actively participating with the installation and management processes. To ensure the survival of the newly installed landscape, the University of Washington students created a five-year management plan for the site, and the Garfield community agreed to implement the plan.

Through renovating portions of the Garfield High School landscape, the UW students gained hands-on experience in integrating theoretical concepts with real-world challenges in the context of partnerships with K-12 students, industry professionals, and community volunteers. The obvious educational and environmental benefits derived through the program also generated interest from the Seattle public school central administration. This partnership became a model for future projects and inspired the creation of the SCL consortium.

News of this innovative and successful pilot project spread to other local schools and community groups, who began asking for similar help in restoring degraded public greenspaces. We also learned of other organizations in the Puget Sound region working on similar projects and sought ways to join forces, rather than replicate each other's efforts. We decided the best way to maximize the benefits of our group was to create the Sustainable Community Landscapes consortium. Our consortium is designed to support education, outreach, and research in applied plant science, both at the University of Washington and in the larger community. Consortium participants come from K-12 and higher education, non-profit organizations, governmental agencies, industry, and the community. Similar programs elsewhere include the Ecological Restoration Institute, which is also geared to integrated fieldwork and hands-on learning (Covington, Fule, Alcoze, and Vance, 2000; Fox, Kolb, and Kurmes, 2000; [1]).

University of Washington students participate in SCL projects primarily through three classes in Environmental Horticulture: EHUF 480, 481, and 482. Together, these

classes provide a transdisciplinary capstone educational experience that benefits both the students and the larger community. Students in all three classes come from a variety of majors, primarily Environmental Horticulture, Landscape Architecture, Urban Planning, Botany, and Wildlife Science.

EHUF 480 – Selection and Management of Landscape Plants – classroom component

EHUF 480, Selection and Management of Landscape Plants [2], provides the theoretical backbone of the landscape rehabilitation capstone series. Students in this course are seniors and graduate students with prerequisite basic plant and soil science courses. This class offers students the opportunity to learn and apply the scientific concepts of plant selection and management. The materials covered in this course, along with the prerequisite soils course, provide the crucial background skills for creating and implementing sustainable landscape designs. Through lectures, readings, and demonstrations students learn important concepts in plant and soil science. They are taught the latest research and techniques and trained to recognize and avoid bad management practices and horticultural myths.

The topics covered in this class are designed to teach students about maintaining plant and ecosystem health. Students discuss such topics as site assessment, site preparation, invasive species, plant inspection, and planting theory. Questions and discussion are encouraged, and students are encouraged to further explore topics of particular interest. Students are invited to share knowledge gleaned from their own experiments and explain their perspective on controversial issues. The textbook, *Arboriculture: Integrated Management of Trees, Shrubs, and Vines* (Harris, Clark, and Matheny, 1999) also serves as a good source of current and accurate information on a number of topics. New research is explored and the students also discuss areas in need of further research. Through the central theme of plant management, students are taught about the many interrelated disciplines involved in landscape restoration and management.

Class topics are sequenced to build off each other, and are taught in the same general order followed by a typical landscape renovation project (i.e. starting with site assessment, moving on to site preparation, then installation, and ending with aftercare and adaptive management). Lectures are organized to aid students in their group and individual projects while teaching them current, accurate information.

Students are taught to think critically when analyzing web sites, books, and other sources of information. Common horticultural myths and environmentally damaging management practices are also refuted in this class. Most prevalent are those practices developed for agricultural crop production and misapplied to permanent landscapes. For instance, a long held belief is that incorporating organic amendments into planting backfill soil will improve plant and soil health. Current research doesn't support this belief, and students in this class are taught about the dangers of soil amendments as applied to permanent landscape installations. While an ideal soil has only 5% organic matter, many sources call for amending soil with as much as 50% organic matter. Any added organic matter will eventually decompose, leading to a sunken hole that may expose or damage plant roots while also creating a potential hazard for pedestrians. In addition, amendments alter soil hydrology, creating sections of soil where water rapidly drains away, and other sections where water collects. Finally, soil amendments create

interface problems at the boundary between the amended and unamended soils. Plant roots may have difficulty crossing the interface, leading roots to circle the planting hole, rather than growing laterally through the soil, thereby de-stabilizing the plant. Students are also warned about a number of other poor management practices such as top-pruning a plant during installation, adding well-balanced fertilizers when only one nutrient is deficient, and dressing pruning wounds.

Exams for the class are also designed to test the student's ability to apply the concepts covered in class. Students are given take-home exams that require them to go into the field and analyze sites and situations from the perspective of a landscape professional. After learning how to analyze plant health, for example, students might be asked to visit a nursery to evaluate the plant stock. Using the perspective of buyers looking for restoration plants, the students are asked to evaluate the quality of plant materials, helpfulness of nursery staff, and accuracy of any brochures or other educational materials given to customers. Students analyze the plant stock, looking for potential problems such as circling or girdling roots, topped plants, tightly wrapped stakes or burlap that is girdling the trunk. Such problems can seriously injure or even kill plants, and indicate improper handling and care of the plants.

When possible, test questions and class assignments are also designed to provide technical assistance to community members. For instance, a community group may need assistance in analyzing their site and brainstorming ideas for possible designs or ways to deal with problem areas. They may not be ready to create or implement a formal design, but need technical assistance to get them started. In such cases, the students might be assigned to visit the site and analyze site conditions, noting both problem areas and assets, and explain their suggestions for rehabilitating the site. Questions such as these help prepare students for real world situations likely to be encountered in the field.

EHUF 480 – Selection and Management of Landscape Plants – field component

Once the students have become familiar with the essential concepts and theories behind plant management and restoration, they are given the chance to apply their skills through a service-learning project. The goal of this project is to bring together students, government and industry professionals, and community groups to solve a real-world problem. Since environmental issues cross many disciplines, our projects integrate social, economic, and scientific skills and teach students about tradeoffs. For their project, the students complete a landscape analysis, design scheme, and management plan for a public site. Working in groups, the students tackle a public landscape, seeking ways to rehabilitate it and make it more sustainable while meeting user needs and maintaining aesthetic appeal. By applying new skills and concepts, students are better able to understand the relevance of what they are learning. The students also gain the hands on, leadership skills that employers desire (Lavendel, 1999).

Community members and school groups who are interested in receiving help with landscape restoration projects are encouraged to submit a Request for Proposal (RFP) at the Sustainable Community Landscapes web site [3]. We review the proposals, visit the site, and meet with the owners and community group to determine if the proposed site will work for a class project. We look for sites that are in need of rehabilitation, especially those in urban areas without many resources. Since we request that community members provide long-term maintenance of the site, we look for dedicated

partners who are committed to caring for and monitoring their sites. SCL also seeks community members and site owners who are flexible and willing to provide the students some latitude in creating and implementing project designs. This gives the students a greater intellectual stake in the project and allows them greater opportunity to experiment.

Once we have accepted an RFP, we take pictures of the project site and post them on the SCL web page, along with a brief site description. Students are then asked to rank the sites they would like to work on in order of preference. Based on the student's wishes, we assign them to teams to work on particular sites. We try to create diverse teams, with a mix of graduate and undergraduate students from a variety of disciplines.

Early in the quarter, students meet with the site's owners, neighbors, those responsible for site maintenance, and any other stakeholders. The groups discuss their goals and ideas for the site as well as any special concerns they have, such as maintaining access for maintenance crews or using non-poisonous plants near small children. Any applicable guidelines, rules, or ordinances (e.g. protecting view corridors, planting trees a minimum distance from streets) are also discussed. Budget or other constraints are explained. Student groups explore the site and note visitor usage patterns. Community partners are encouraged to provide any history or background information that will assist the students in researching the site and creating a better design. The community is strongly encouraged to continue working with the students throughout the process of site analysis and development of a design and management plan. Cooperation and mutual understanding are vital to the success of the project. By involving key players, we can help insure that stakeholders have a say in the restoration and will feel that it meets their needs and is something they can support. We have found that this makes the projects more successful and improves the quality of care provided.

Depending on what type of site they are working on, students and community clients will have to follow different guidelines. At a school, for instance, student safety will be paramount. Maintaining safety may require using non-poisonous plants free of thorns, avoiding planting dense thickets that serve as hiding places, and maintaining views of school grounds from office windows. While specific needs will vary with location, school district, student population, etc., some basics apply to all sites. North Carolina has published a good primer for planning projects on public school sites (Public Schools of North Carolina, 1998). Parks, meanwhile, have their own guidelines regarding public involvement in landscape renovations. In Seattle, WA, for example, the Parks and Recreation department (1999) states that any plans that will modify the property's appearance are subject to review by the parks department and the general public. Public access and security are important considerations, as is the impact on surrounding communities. Rules also exist regarding what aspects of the renovation the public can perform and what city employees must do. These rules and guidelines are important for students seeking to create designs that are flexible, follow the correct procedures, and meet the needs of all interested parties.

Once the students have an idea of the goals, visions, and needs of stakeholders, they undertake a thorough site analysis. Everything from soil texture, pH, and bulk density to drainage patterns, access, wildlife usage, and light levels is researched. The students gather data throughout the site and analyze them to determine what conditions any new plants must adapt to. Students identify typical urban problems, such as compacted soils,

poorly drained areas and diseased plants, and determine possible solutions. This information is vital for creating an environmentally responsible and responsive design. Without understanding site conditions, the students cannot know the site's limitations and potential and cannot create the most sustainable design.

After researching site conditions and learning about goals and guidelines for the site, students begin to draft a design. They use what they've learned in classes to come up with a plan that is both feasible and environmentally sound. The students choose a general theme for the site, then choose a plant palette and hardscaping features (e.g. benches or a path) to fit the theme. The theme will vary with site uses and be designed to blend with existing landscaping whenever possible.

An important part of the design process is choosing site-appropriate plants. Students look to a variety of reliable sources including textbooks, peer-reviewed journals, and educational web sites (e.g. Pojar and Mackinnon, 1994; Reimer and Mark, 2002, Harris et al., 1999) to find plants that are adapted to the existing site conditions. From this, they narrow their selections to fit certain criteria, such as shade-tolerant, native, or low-maintenance species. The selected plants must be able to tolerate existing site conditions in addition to any future modifications (e.g. increased light levels resulting from the removal of hazard trees). The students are taught to group plants with similar needs to reduce the amount of time and resources spent maintaining the site.

Often, the students design landscapes with themes that can be used to educate site users. For instance, at a local high school, we installed a teaching garden focused on plant evolution and diversity. The site was divided into sections focused on ferns, angiosperms, and gymnosperms. Plants were grouped in the order in which they evolved. Additionally, our students provided a plant identification guide so that visitors can wander through the site, recognize plants, and see how they have adapted and changed over time. Differences in leaf texture, morphology, seed production, and other characteristics can be seen and compared. The high school's ecology teacher has since incorporated the garden into her class, using it to teach her students about diversity in the plant world. She also has her students help maintain the site, further enhancing the landscape's educational value.

At a local park, meanwhile, students worked with a community volunteer group and city staff to create a design that fit with the general concept plan for the park. The concept plan calls for restoring the native character of the park, which is currently overrun with invasive species covering steep slopes. To fit the theme, the students decided to emphasize plant species native to the Puget Sound region. With this in mind, students chose a native plant palette that would demonstrate plant diversity. The students also selected and arranged plants to perform other functions, such as limiting soil erosion or using strategically placed, thorny plants to keep visitors away from steep slopes.

After drafting one or several basic design concepts, the students again meet with community groups and site owners to review their ideas. If possible, they meet with neighbors and site visitors to gain feedback on the plan. At this point, potential problems and alternatives can be discussed. Practical details such as a budget and supply acquisition can begin to be worked out. Suggestions can be made for improving the project and making it more feasible or sustainable.

After the students have created a design that is environmentally sound and meets the needs of the site's owners, neighbors, and primary users, they must draft a budget and begin writing a five-year management plan for the site.

Creating a budget is an important part of real-world restoration. Students must work with the people who will help implement the plan to ensure that the plan and associated budget are realistic. Class members research budget items to determine reasonable prices. Students look at multiple materials and sources to find the most cost-effective, yet reliable way to achieve their goals and implement their design. In performing the research, students often discover organizations that are willing to provide reduced price or free materials for environmental and educational projects. The students and community members also explore grants that may help to cover some costs of the project.

Since community members or site owners (e.g. parks gardeners) will often be in charge of carrying out the maintenance, the plan must be clear and easy to follow. Due to the unpredictability of the natural world, the plan must also be flexible enough to allow for adaptive management as site conditions change. At public sites, neighbors and governmental owners or administrators may also change. The plan must be flexible and clear enough that new stakeholders and caretakers will be able to follow it. Actual plans can be viewed at the Sustainable Community Landscapes website [3].

At the end of the quarter, the students have a poster session (Plate 1) and invite community members, project site managers, and other interested parties to attend. During this session, the community gets to see the final plan for the project and ask questions of the students. A final bound copy of the site analysis, design plan, and management plan is also presented to the group that submitted the RFP. If everyone involved is pleased with the plan and it is deemed feasible, community members and students in EHUF 481 or 482 can help implement the plan.

Plate 1: Community members discussing a project design with UW students

At the end of the quarter, we solicit feedback from all participants. Community partners are asked what they think of the students' work and ideas. Any suggestions for making the process easier or smoother are welcomed. Student ideas for improving the projects and process are also solicited. Everyone is asked to suggest ways to improve

the success of these projects and make the partnerships run more smoothly. Sustainable Community Landscapes staff meet again with the community clients, site owners and managers, and other interested parties. We discuss the students' designs and plans and how or if we would like to continue the partnership. We also remain available to answer questions and provide technical assistance such as planting demonstrations or setting up a database for monitoring the project.

EHUF 481/482 – Field Practicum in Plant Selection and Management

These two classes [4], one taught fall quarter and the other offered spring quarter, provide students with hands on experience in implementing the designs created by students in EHUF 480. The field practicum students, who have completed EHUF 480, have one quarter to finalize and implement a landscape rehabilitation plan with the help of community partners.

The projects for the field practicum also begin with community groups or government agencies submitting a request for proposals. Some projects are simple enough to be designed and implemented in one quarter. Other projects are more complicated; in that case, the design is created one quarter (EHUF 480), with implementation happening in a subsequent quarter.

Both field courses begin with a visit to the project site. Students explore the site, analyzing existing conditions and usage patterns. They also meet with the owners of the site, those in charge of maintenance, and any community groups that have a stake in the site. If a design theme or concept plan exists for the site, the students and community discuss it and decide on any needed updates or changes. If no specific design exists, the stakeholders begin to create one. The quarter is planned so that the students and community partners have several weeks to finalize a plan before they begin implementation.

While the students are working on refining their design and acquiring plants, mulch, and other needed materials, they receive hands-on demonstrations in basic management practices. Washington Park Arboretum staff members instruct students in topics such as pruning techniques, hazard tree assessment, and plant installation. The arboretum staff trains students in the latest techniques and shows them the results of using these techniques at the arboretum. These hands-on classes give students the chance to practice these techniques before using them in the field.

After the students have been trained in field skills, finalized their planting plan, and have created a plan to acquire needed resources, they can begin to implement the plan. Community members are encouraged to help with the project, and students help to teach and supervise them.

The first step of implementation is site preparation. This involves removing invasive species as well as unhealthy plants that cannot be salvaged. In some cases, healthy existing plants that don't fit with the new design will need to be relocated to more appropriate locations. Sometimes specialized machinery such as a backhoe or turf cutter will be required. If that is the case, we find a trained professional to run the equipment. The SCL consortium has found a number of professionals who are willing to donate such services. Adding a thick topdressing of organic mulch over the entire planting area is another important step in site preparation. This is particularly important in sites with compacted soil and to protect the roots of plants that are to be retained.

In some cases, retaining walls, paths, or other hardscaping will need to be added to the site (Plate 2). We have found that we often have students or community members who are experienced in installing such materials and can lead this portion of the project. If we cannot find an experienced student, we look to the Sustainable Community Landscapes network for assistance. With our diverse membership, we can usually find members willing to provide guidance and donate time and materials.

Plate 2: University of Washington and Garfield High School students installing a retaining wall

If the plan calls for installation of planting berms, raised beds, or similar landscaping, we install them after the site is prepared and needed hardscaping in place.

Once the site is fully prepared, installation can begin. Our students are trained in current, appropriate planting techniques to improve plant survival. They are instructed about everything from inspecting plants for disease or pathogen damage to digging the correct size planting hole to proper aftercare. The installation begins with removing the plants from their containers and inspecting the roots and shoots for signs of disease or damage. Ideally, this would happen in the nursery before the plants are delivered. Since many of our plants are donated, this is not always possible, so the students also learn how to handle less-than-ideal plant material. Only dead, damaged, or diseased plant material is pruned out, so the plant will devote resources to becoming established, rather than replacing pruned tissue. We are working on a new installation process to improve establishment of containerized plants. Our technique involved removing all container media from the roots prior to installation. This reduces soil interface problems and also allows for close inspection of roots. The students are careful to inspect the roots and trim or straighten out circling, kinked or girdled roots. Once the plants are ready for installation, the students dig planting holes at least twice as wide as the root system, but no deeper than the container material. They then build a small berm of soil in the planting hole to help spread the roots evenly throughout the planting hole (Plate 3). The hole is then backfilled with native soil and gently tamped into place.

Plate 3: A plant being prepared for installation; note the radially distributed roots

Once the plants are installed, the students perform immediate aftercare. One component of this consists of applying mulch to the planting area, keeping it an inch or so from plant trunks to prevent stem rot or disease problems. The mulch will help to retain soil moisture, reduce weed germination, and provide organic matter to the plants. Newly installed plants are also watered in well to help settle the soil and reduce transplant shock. Finally, if staking is needed, stakes are applied no more than one-third of the way up the trunk and loosely enough to allow the plant to move and develop taper; stakes are removed after one growing season.

At this point, the installation is done, and the students work to train the community caretakers in proper management. The students often give short demonstrations detailing their projects and recommended maintenance. They also write five-year management plans to assist neighbors, maintenance people, and others in properly caring for their project sites. Once the quarter is over, the Sustainable Community Landscapes program coordinator remains available to answer additional questions and provide needed assistance. We also continue to monitor the site, taking pictures and documenting the project's success. This helps us to determine the best techniques to improve plant survival and community acceptance and care of the site. Since environmental knowledge continually evolves, we adapt the class and techniques as we learn more about good and poor techniques.

Benefits of the projects

These class projects benefit both the environment and the students and other participants. Our program provides the sort of interdisciplinary and integrated education that is needed by professional plant scientists. After completing a public landscape rehabilitation, students are prepared to work with people from a variety of backgrounds and disciplines, from schoolchildren to community activists to green industry professionals. The projects provide participants with a solid understanding of

the complex nature of landscape restoration, which incorporates ecological, economic, and social aspects.

Participants, particularly students, also learn about the field of environmental horticulture from these projects. By including K-12 students, we reach a new generation and introduce them to a new field that presents educational and career opportunities previously unknown to them. Our projects provide the students with a glimpse of possibilities and may encourage the students to pursue a horticultural education. All participants also gain practical experience that they can apply in other areas. The students may be inspired to form a horticulture or ecology club to care for their new landscapes or to work on further greening their campuses or neighborhoods.

Project participants also gain many benefits from these projects and learn important skills. Students learn about working with community and professional groups to achieve a vision for a public site. Participants from diverse backgrounds learn to work together towards a common goal. Often, obstacles and roadblocks appear, and students must learn how to deal with them. For instance, site owners may decide that they don't like a certain part of the plan and force changes. Those in charge of maintaining the site may decide that they cannot or will not be flexible (e.g. not wanting to mow around new trees). Last minute changes may be required to satisfy new demands, budgets may be cut, or other problems may arise. We have found that identifying stakeholders early in the process and involving them in the project can solve many such problems. By giving people a say in the process, students can design projects that meet the needs of most, if not all, site users.

Since we work on public sites, we must also deal with public access and the problems that may present. For instance, visitors sometimes steal plants from sites; crows also routinely pull up small plants, dropping them nearby. Sites and new plants may be vandalized. This is where vigilance and regular monitoring come in handy. Simply having neighbors, owners, and community members on the site, checking on plants, watering, and generally keeping an eye on things can serve as a deterrent to crime. Involving the community and giving them a stake in caring for their site also helps to ensure proper management practices.

Through this series of capstone courses, students from different disciplines learn to integrate theory with practice in the context of a landscape restoration project. Not only do our students gain a solid understanding of sustainable management practices, they also learn how to function in multidisciplinary teams. These teams work with community client groups to design aesthetically pleasing, environmentally sound landscapes. In doing so, these students of Washington State's largest public university are able to contribute significantly to the people that support their education.

References:

Covington, W.W., Fule, P.Z., Alcoze, T.M., and Vance, R.K. (2000) "Learning by doing: education in ecological restoration at Northern Arizona University," Journal of Forestry, Vol 98 No 10, pp. 30-34

Fox, B.E., Kolb, T.E., and Kurmes, E.A. (1996) "An integrated forestry curriculum: the Northern Arizona University Experience," Journal of Forestry, Vol 94 No 3, pp. 16-22

Harris, R.W., Clark, J.R., and Matheny, N.P. (1999), Arboriculture: Integrated Management of Trees, Shrubs, and Vines, 3rd Edition, Prentice Hall, Upper Saddle River, NJ.

Lavendel, B. (1999) "Ecological restoration in academia," Ecological Restoration, Vol 17 No 3, pp. 120-125

Pojar, J. and MacKinnon, A. (1994) Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska, Lone Pine, Redmond, WA.

Public Schools of North Carolina, State Board of Education, and Department of Public Instruction (1998), The School Site Planner: Land for Learning, Division of School Support, Raleigh, NC. Available http://www.schoolclearinghouse.org/pubs/schsite.pdf

Reimer, J. L. and Mark, W. (1999) "SelecTree: A Tree Selection Guide," Urban Forest Ecosystems Institute at Cal Poly State University, San Luis Obispo. Available: http://selectree.cagr.calpoly.edu/

Seattle Parks and Recreation (1999) "Public involvement policy for proposals to acquire property, initiate funded capital projects, or make changes to a park or facility," Available (Seattle Parks and Recreation) http://www.cityofseattle.net/parks/projects/public_involvement_policy.htm

Endnotes:
[1] http://www.eri.nau.edu/default1.htm
[2] http://faculty.washington.edu/lindacs/EHUF%20480/Syllabus.html
[3] http://www.cfr.washington.edu/research.mulch/
[4] http://faculty.washington.edu/lindacs/EHUF%20481/Syllabus%20SP2002.html

Biography

Linda Chalker-Scott and Angela Cahill work at the University of Washington's Center for Urban Horticulture in Seattle, USA. Linda is an Associate Professor of Sustainable Landscape Management. She received her PhD in Horticulture from Oregon State University in 1988, taught environmental and plant sciences at SUNY College at Buffalo from 1989-1997, and moved to University of Washington in 1997. She teaches Environmental Science, Applied Plant Stress Physiology, and Selection and Management of Landscape Plants. The latter class allows students to

learn, and then apply, the concepts of sustainable landscape management in public landscapes. In conjunction with our Sustainable Community Landscapes program, the students perform a complete site analysis, develop a sustainable planting design, and create a 5 year management plan while working with community volunteers.

Angela received her BS in Environmental Horticulture from the University of Washington in 2000. She manages the Sustainable Community Landscapes consortium, coordinating its landscape rehabilitation projects, workshops, and outreach activities.

Return to Contents

6. Environmental Education towards the Path of Sustainability Institute for Environment and Development Studies

Ameer H. Chowdhury,

Institute for Environment and Development Studies-Bangladesh.

Bangladesh is one of the poorest of the developing countries with a low resource base, a very low land-man ratio, threatened by both natural hazards and anthropogenic mismanagement and over-exploitation. The vast majority of the population is amongst the poorest in the world and lives almost exclusively on the natural resource base. But this resource base is under serious threat and environmental planning is necessary to signal any hope for survival with dignity and sustainability.

The people need income and employment now, even if it means resource mining or heavily polluting actions. Though the poor are often the victims of environmental degradation and mismanagement, they may have to participate in irreversible processes to make out of living.

Administrative capability in environment is generally weak and overburdened. Bangladesh has a fair number of environmental laws but the level of observance and enforcement capability is very low. The bureaucracy, for an environmentally sound development agenda, will have to be pro-people and pro-active. The existing bureaucracy, in many cases, still resembles and earlier colonial model.

Bangladesh has a literacy rate of less than thirty percent. Very few government agencies or even universities had the capability to address environmental issues with a sufficient degree of competence. Though recently more discussions are being undertaken, lack of systematic data on natural resource systems is a hindrance to develop proper environmentally sound development options.

These are still being undertaken with little or no consideration to the environment. People's participation is very often missing. Lip service given to environment and people's participation can be misleading and may distort genuine attempts to improve projects toward sustainability.

At the official level, a new Ministry of Environment and Forests and an upgraded Department of Environment have been formed. A National Conservation Strategy exists, an Environmental Policy has been finalized and a National Environment Management Action Plan (NEMAP), however inadequate, is in the pipeline. Their implementation is awaited and some concerns have been expressed as to the limited scope and lack of effective public discussions on these.

Environmental awareness cannot be addressed adequately through the formal education system. Awareness must also be created through non-formal means since the national overall literacy rate is around 35 percent, with female literacy is estimated at only

around 20 percent.

In Bangladesh, immediately after independence, the government set up a Bangladesh Education Commission on 1972 under the chairmanship of a distinguished scientist named Dr. M. Qudrat-I-Khuda to frame a comprehensive education policy suited to the needs of the new nation. The commission submitted its Report in 1974. In the light of this report, a National Curriculum and Textbook Committee was set up in 1975 and the committee completed the framing of new curricula and syllabuses for various stage of school education by 1978. New textbooks were written according to the new syllabuses and these began to be introduced, in stages, in 1978. In this syllabus, in place of the earlier science and social studies, an integrated subject called environmental education was introduced in the Primary (grade 1-5) and junior secondary (grade 6-8) stages. In the syllabus of Environmental education for grade 3, there are such topics as "the need for and methods of conservation of the environment" and wastage and pollution water- their prevention and conservation water resources. "such themes are continued till the end of the secondary stage".

The main principles according to which the syllabus of Environmental Education for the primary stage was prepared were the following.

? the pupils would be able to observe and know their immediate environment and develop a scientific attitude in solving their every day problems.?

? The study of separate subjects likes biology, physics, chemistry, geography, history, social studies, etc. do not help young pupils to learn about the totality of the environment; hence an integrated subject would be more useful;?

? Knowledge about proper use of the resources of the environment and of their conservation is essential for the maintenance of human life and of civilization.

Higher Education Research

At the level of higher education, which is provided in ten universities and about 800 colleges in the country, ecology is a component of a paper under such subjects as botany and zoology in the degree pass course (2-year duration after higher secondary grades 11-12). And a full paper in botany in the honors course (3-year duration after grades 11-12). Practically all the major universities of the country have included ecological considerations in the Honors courses in such subjects as botany, zoology and geography. At the post-graduate level, there is a compulsory paper on Ecology in post-graduate classes in botany and zoology. In the University of Dhaka, at the M.Sc. level there are also courses on Environmental Management and Perception and Resources Management and Environment in the Department of Geography. Similar environment related courses are also offered in the Bangladesh Agricultural University and the Bangladesh University of Engineering and Technology. However, the facilities for research in the universities in Bangladesh are extremely limited. A number of research organizations in the country have n recent years-developed extensive research capabilities in the field of environment. Among these are:

? Bangladesh Agricultural Research Council (BARC) which coordinates a national agricultural research network in Bangladesh including such agencies as the Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice

Research Institute (BRRI), Bangladesh Jute Research Institute (RJRI), Bangladesh Agricultural University (BAU), Department of Fisheries, etc.?

? Bangladesh Institute for Development Studies (BIDS) has a strong team of economists and social scientists and a solid capacity for macroeconomic research in various areas related to resources management and ecological studies.?

? Institute of Forestry in Chittagong which is the sole institution in the country providing university level education in forestry.

? Bangladesh council of Scientific and Industrial Research has extensive capacity for research on the industrial aspects of the environment but it in not being properly utilized.?

? Space Research and Remote Sensing Organization (SPARRSO) has been involved in studies related to agriculture, fisheries, forestry, oceanography, water resources, weather forecasting and cyclone warning, etc. using remote sensing technology.

? A number of private research agencies such as the Bangladesh Center for Advanced studies(BCAS) and Center for Development Research have in recent years initiated some research activities in the field of environment and their efforts are likely to gather momentum in the coming years.

Sustainable development is the lasting use of resources. Shortsighted use of resources to meet today's needs occurs in Bangladesh in the management of land, forest and fishery. Uncoordinated and uncontrolled projects harm the environment and hamper sustained development. With Bangladesh's limited resources, there is a need to stop the short-sighted unsustainable development which leads of forest removal, discharging toxic chemicals, removing coral and over exploiting fishery. There is need for long term multi sectorial planning based on the knowledge and wisdom of the involved in the development process. Emphasis is to be placed on projects and programs, which promote economic development but yet conserve or enhance the productivity of ecosystems and the quality of the environment. Without sustainable development and use of resources now, future generations will face a very grim situation indeed.

People are, in general, articulate and perceptive. They have traditional knowledge and a feel for environmental issues, particularly, as the affect their daily life. but little formal information reaches the rural population. An environmental awareness drive is urgently needed and further need is of higher education that will impart the knowledge and strategies of sustainable development. The government and the NGO's could jointly share the burden. Some effort have been made, mostly by NGO's and few commercial education houses.

While the average man on the street, of on the farm, becomes quickly aware of the adverse changes in the environment which affect his life, he may not always know or understand the factors which cause these changes. Often people without proper education even think that such changes are after all inevitable, of even acts of God, beyond human control, and hence lack the will for any remedial action. But scientists, who investigate such phenomena, tell us that most of these changes are caused, directly or indirectly, by the actions of man and hence can be controlled though proper education and planning.

Since the days of the Industrial Revolution,, man has increased his productive capacities manifold. Over the last two centuries, a great flowering of scientific knowledge has taken place, many new technologies have been generated, which, in their turn, have produced an abundance of consumption goods. New energy sources have been tapped, new materials created, many diseases conquered and a large share of humanity has been able to taste the "good life".

As man has increase his mastery over nature, his numbers have been increasing fast. His needs have also been increasing at a correspondingly accelerated rate resulting in even greater demands on the limited resource of the earth.

The development of the past two centuries have, unfortunately, not been all in the right direction. Reckless search for the good life has often put on nature many scars of unkind human intervention. The finely interwoven balance of nature has stated to be disturbed here and there. Rich and poor nations have been exploiting nature with equal lack of concern for the future the rich countries using more of the resources than the poorer ones. Thus the rate of use of physical and biological resources of the earth has, in many cases, gone beyond the limits of natural regeneration. Destructive use of such resources has started to impose limits on the sustenance of the very process of development.

Over a large part of human history, either consciously or unconsciously, man has been modifying the natural environment though his actions. Some of these actions influence the environment the environment in a positive manner, others in a negative manner. These influences result from group actions as well as individual actions. Some of the effects are planned or anticipated while others are not. Often men act in a manner which produces a negative effect on the environment because they are not aware of the consequences of such action.

In order to create this awareness of the importance of conservation of the natural environment, proper education and actions are needed at various levels and in various modes. Needless to say, the treatment of the message of conservation should, in all cases be tailored to the various levels and modes of preservation.

In the advanced countries, which have a high level of educational development, environmental issues are interwoven into the educational curriculum In Bangladesh, educational coverage beyond the primary school level is relatively low. However, issues relating to the environment have been incorporated in the curriculum of both the primary and secondary stages.

Return to Contents

7. The Earth Charter: An ethical framework for "good' globalization (Draft Version).

Peter Blaze Corcoran

Florida Gulf Coast University, USA

Note: This is a draft version of this paper. The final version will be presented at the conference. It will also be published in a University of Luneberg Press publication 'the Luneberg Declaration of COPERNICUS-CAMPUS'.

> The world economy is today a huge casino. Recent analyses indicate that for every dollar that goes into trade, over one hundred end up in speculative operations completely disconnected from the real economy.
>
> As a result of this economic order, over 75 percent of the world population lives in underdevelopment…extreme poverty has already reached 1.2 billion people in the Third World. So, far from narrowing, the gap is widening.
>
> The revenue of the richest nations that in 1960 was 37 times larger than the poorest is now 74 times larger. The situation has reached such extremes that the assets of the three wealthiest persons in the world amount to the GDP of the 48 poorest countries combined.
>
> Fidel Castro

A premise of the Luneburg Declaration is that higher education for sustainable human development is a critical component of efforts to humanize globalization. Worldwide exchange of capital, products, and a culture of consumption are with us; but if globalization is to mean more than transnational corporate commidification of resources and cultural concepts, it needs an ethical framework.

Steven C. Rockefeller, Chair of the Drafting Committee of the Earth Charter, has said:

> We urgently need a shared vision of basic values that will provide a basis for world wide partnership and an ethical foundation for the emerging world community. The mission of the Earth Charter initiative is to help establish such a foundation. The Earth Charter endeavors to make clear that in the final analysis the problems the world faces are ethical ones.
>
> Rockefeller, p. 7

If the problems we face are, in the end, ethical problems, then, indeed, the solutions must be solutions to which ethics point. We need an ethical framework for sustainability in the context of globalization. In this brief essay, I will argue that the

Earth Charter, by virtue of its remarkable birthright and content can provide a higher education with such a foundation for humane and just globalization.

Another premise of the Luneburg Declaration is that education in all its forms plays an indispensable role in addressing the crucial challenges of sustainable development. Higher education, with its powerful concentration of intellectual resources and privileged position in society, has a leadership role, indeed, a moral responsibility, to seek ethical and practical answers to the economic, social, and environmental problems caused by globalization. Higher education, then, can take the lead in pointing the way toward an integrated vision of the challenges and the solutions. I believe that the Earth Charter, recognizing as it does the indivisibility of environmental protection, human rights, equitable human development, and peace, is a wholesome conception of sustainability that can assist higher education in its response to globalization.

History and Structure of the Earth Charter[5]

> We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of earth, declare our responsibility to one another, to the greater community of life, and to future generations.
>
> Earth Charter, Preamble

The drafting of an Earth Charter was part of the unfinished business of the 1992 Rio Earth Summit. In 1994, Maurice Strong, Secretary General of the Earth Summit and Chairman of the Earth Council, and Mikhail Gorbachev, the President of Green Cross International, launched a new Earth Charter initiative in The Hague with support from the Dutch government. An Earth Charter Commission was formed in 1997 to oversee the project, and an Earth Charter Secretariat was established at the Earth Council in Costa Rica.

To the best of our knowledge, the Earth Charter Initiative has involved the most open and participatory consultation process ever conducted in connection with the drafting of an international document. Tens of thousands of individuals and hundreds of organizations from all regions of the world, different cultures and diverse sectors of society have participated. The Charter has been shaped by experts, government and civil society leaders, students, and representatives from indigenous groups and grassroots communities. I believe it is an important expression of the hopes and aspirations of the emerging global society. It is part of a growing worldwide people's movement pursuing major challenges in our values and institutions in order to ensure a better future for all. It is, truly, a people's charter.

A final version of the document was released by the Earth Charter Commission in March 2000, and a new phase of the Earth Charter Initiative began, which involved circulation of the document as a people's treaty

[5] This section relies on several descriptions of the process and content of the Earth Charter and especially the Earth Charter Briefing Book and The Earth Charter Initiative Handbook.

throughout the world in an effort to promote awareness and commitment to a sustainable way of life. The major objectives of the Earth Charter Initiative are to promote a worldwide dialogue on shared values and global ethics; to set forth a succinct and inspiring vision of fundamental ethical principles for sustainable development; circulate the Earth Charter throughout the world as a people's treaty, promoting awareness, commitment, and implementation of Earth Charter values; and seek endorsement of the Earth Charter by the United Nations General Assembly.

The Preamble of the Earth Charter briefly describes the cosmological and ecological situation and the major challenges and choices facing humanity. There follow sixteen main principles, which are divided into four parts. Each part contains four main principles with a number of supporting principles that elaborate the meaning of the main principles. The principles in the Charter are formulations of fundamental ethical guidelines and major strategies. The Charter does not attempt to describe the mechanisms and instruments required to implement its principles. This is a task for other international legal instruments and for national and local sustainable development plans.

A Pedagogy for Globalization

As never before in history, common destiny beckons us to seek a new beginning. Such renewal is the promise of these Earth Charter principles. To fulfill this promise, we must commit ourselves to adopt and promote the values and objectives of the Earth Charter.

This requires a change of mind and heart. It requires a new sense of global interdependence and universal responsibility. We must imaginatively develop and apply the vision of a sustainable way of life locally, nationally, regionally, and globally. Our cultural diversity is a precious heritage and different cultures will find their own distinctive ways to realize the vision. We must deepen and expand the global dialogue that generated the Earth Charter, for we have much to learn from the ongoing collaborative search for truth and wisdom.

Earth Charter, "The Way Forward"

Such advancement of high-minded values, such changes of mind and heart, and such senses of interdependence and responsibility across culture can only be achieved through education. Realizing culturally-rooted visions of sustainability and searching for cross-cultural collaboration is, inherently, a process of education. The Earth Charter Initiative has said from the beginning that the Earth Charter is an educational resource of significant value. According to the Earth Charter Briefing Book,

Discussion of the Earth Charter in classrooms, conferences, and workshops can heighten awareness of the basic challenges and choices that face humanity. It can help people learn to think globally and holistically. It can focus attention on fundamental ethical issues and their

interconnectedness. It can serve as a catalyst for cross-cultural and interfaith dialogue on shared values and global ethics. It can be used to generate in individuals and communities the kind of internal reflection that leads to a change in attitudes, values, and behavior. (Earth Charter Briefing Book, p. 10).

The art and science of teaching about, from, with, and for the Earth Charter offers a promising pedagogy for exploring such shared values and global ethics. The story of the Earth Charter itself—the commitment, the emergence of a people's charter for the twenty-first century, is compelling. It is a hopeful saga of global cross-cultural collaboration. Teaching about this process and its successful culmination is expository and inspiring.

Individual principles can be used too as ways of exploring issues and as a guide for further discussion of actions that are ethical and sustainable. Teaching from the Earth Charter on the major principles of care for life, ecological integrity, social and economic justice, and creating a culture of peace opens topics of critical importance. Individual subprinciples can be used to support, justify, and clarify concrete issues as well as contextual and related ones.

The Earth Charter in its comprehensive inclusion of social, political, economic, and environmental problems and solutions can be used for teaching the interrelatedness of these issues. Teaching with the Earth Charter as the content of sustainability in all its pluralism of thought can give students a conspectus of the debate. It can serve as a framework for sustainability education.

In appropriate settings, one can advocate on behalf of the principles. Teaching for the Earth Charter can have many aims--to connect students to the vast cosmological mystery, to find a language of reverence and humility, to contribute to the discourse of how the principles might be realized. In this way, it can serve as an invitation to participate in action.

The Rationale for an Ethical Framework

I am concerned that globalization has been an unguided, leaderless phenomenon that has left millions of people with no immediate apparent benefits. Yes, it has increased global wealth, but is has also diminished the value of traditional cultures and ways of life, it has opened up old wounds, and it has created a new set of injustices that breed violence as well as political and religious extremism. I am an economist, but I am convinced that we cannot go on with the pure economization of life, where everything is measured in terms of money and the capacity to generate wealth. I am convinced that humanity needs a common agreed ethical framework.

Ruud Lubers, p. 1

Increasingly, we see the global movement of money, of ideas, of people. Increasingly, we see the need for shared commitments to equity, justice, environmental integrity, and peace. Globalization, with its rapacious appetite for natural and human resources, and with its lack of democratic governing

forces, must be turned to the good. If it can be, I believe it will be through finding common ground among all peoples on ways to manage global economic forces, and by creating cultural forces to insure the fundamental principles of a global community that is sustainable.

The Earth Charter is an inspiring declaration of such values. It has been influenced by philosophical traditions of secular and religious belief, the global ethics movement, international law, peoples, treaties, contemporary science, and the wisdom of diverse groups of indigenous peoples.

Surely it is not the last word on a global ethical framework, but it is an invitation to reflect on the significance of globalization for life on earth. It is also a call to consider the responsibility of the academy to raise issues related to the direction in which globalization is going. If our way of life is to be a sustainable one, if globalization is to be humane, we in higher education need to engage deeply in such challenges.

The core values of the Earth Charter, as Brendan Mackey, Director of Education for the Earth Charter has written, "are life affirming, promote human dignity, advance environmental protection and social and economic justice, and respect cultural and ecological diversity and integrity." They are an excellent place to begin. They represent serious intellectual and cultural efforts to chart a course toward global responsibility and global sustainability. How we manage globalization will determine the quality of life on Earth. Institutions of higher education, in particular, have a moral obligation to examine critically globalization and seek to move it in a direction that is humane, just, and sustainable—in the direction of good. The Earth Charter provides an ethical framework for this urgent task.

References

Castro, Fidel. March 21, 2002. Untitled speech to the International Conference on Financing for Development. Monterrey, Mexico.

Earth Charter Commission. 2000. The Earth Charter. Available: http://www.earthcharter.org.

Earth Charter International Secretariat. 2001. *The Earth Charter Initiative Handbook*. San Jose, Costa Rica. Available: http://www.earthcharter.org/resources/publications/handbook.pdf.

Earth Charter International Secretariat. 2000. *Earth Charter Briefing Book*. San Jose, Costa Rica.

Lubbers, Ruud. December 6, 2001. Untitled address to the Nobel Peace Prize Centennial Symposium. Oslo, Norway.

Mackey, Brendan. December, 2001. "Update on the Earth Charter Education Programme." Earth Charter Bulletin.

Rockefeller, Steven C. September 29, 2001. "The Earth Charter: Building a Global Culture of Peace." Speech at the Earth Charter Community Summits, Tampa, Florida.

Return to Contents

8. The South Carolina (USA) Sustainable Universities Initiative: A multi-institutional, multifaceted approach to educating for sustainability

Bruce C. Coull, [1] Patricia L. Jerman[2], Alan W. Elzerman, [3] Michael G. Schmidt, [4]

All correspondence should be addressed to:
Bruce C. Coull
School of the Environment
702 G Byrnes Building
University of South Carolina
Columbia, S.C. 29208
803.777.9153 (phone)
803.777.5715 (fax)
bccoull@sc.edu

[1] School of the Environment, University of South Carolina, Columbia, SC 29208
[2] Sustainable Universities Initiative, 702G Byrnes Building, USC, Columbia, SC 29208
[3] Department of Environmental Engineering and Science, Clemson University, Anderson, SC 29625
[4] Department of Microbiology and Immunology, Medical University of South Carolina, Charleston, SC 29425-2330

ABSTRACT: Clemson University, the Medical University of South Carolina in Charleston, and the University of South Carolina, USA, are now in the fourth year of a productive partnership — the Sustainable Universities Initiative (SUI). In 1998, the presidents of the three universities signed a pledge to cooperate in leading the way toward a more sustainable future through teaching, research, community service and facilities management. In 2000, the state's legislative body appropriated funds to expand the program to other state-supported institutions of higher education. To date, 13 four-year and technical schools have joined.

The effort was initiated by a private foundation with business interests in South Carolina and abroad. In the view of the foundation's trustees, Americans are less attuned to sustainability than Europeans; they suggested the three research universities work together to effect a change.

The primary focus of our efforts is to "change our product" — to help students understand how to meet fundamental human needs without destroying the planet's ability to support us. We work with faculty to expand their teaching and research agendas and with administrators and operations managers to ensure that our institutions are reducing their impacts on the environment.

We determined that the most effective approach would be to try many things, at many levels of university life, with the hope of institutionalizing those ideas that proved workable. We light many fires, see which ones "catch", then fan the flames. It is an approach that has worked well for us. Various examples are presented.

Keywords: **sustainability, higher education, consortia, campus greening, environmental education**

The South Carolina (USA) Sustainable Universities Initiative: A multi-institutional, multifaceted approach to educating for sustainability.

South Carolina, located in the southeastern portion of the United States, is blessed with beautiful beaches, mountains, and unspoiled rivers close to population centers. It faces intense development pressure, in part due to the status of the state's economy. While there are pockets of very high income and exceptional student performance, the state as a whole ranks near the bottom of all states in per capita income and educational achievement. Thus, it is crucial to reach university and college students with the message of sustainability.

Clemson University located in Clemson, SC, the Medical University of South Carolina (MUSC) in Charleston, and the University of South Carolina (USC) with its main campus in Columbia, the state's capital, are now in the fourth year of a productive partnership — the S.C. Sustainable Universities Initiative (SUI). For complete information see the SUI website, www.sc.edu/sustainableu. In 1998, the presidents of the three schools signed a pledge to cooperate in leading the way toward a more sustainable future through teaching, research, community service and facilities management. In 2000, the state's General Assembly appropriated one-time funds to expand the program to other state-supported institutions of higher education. [1] To date, 13 four-year and technical schools have joined. (Figure 1.)

The Initiative was sparked by a private foundation with business interests in South Carolina and abroad. In the view of the Foundation's trustees, Americans are less attuned to sustainability ... to melding what progressive industries refer to as the "triple bottom line" of economic, environmental and social performance into a cohesive whole ... than Europeans. They felt that higher education was the best place to foster change and suggested that the three research universities begin by working together.

The primary focus of our efforts is to "change our product" — to help students understand how to meet fundamental human needs without destroying the planet's ability to support us. We do this by working with faculty to expand their teaching and research portfolios and by working with administrators and operations managers to ensure that our institutions are practicing what faculty preach. SUI serves as a catalyst for activities that will make the state's three research universities, other educational institutions, and ultimately, the state as a whole, more sustainable.

If our institutions were three divisions of a large company, we would say that our strategy is to facilitate change within the corporate culture, beginning with product engineers (faculty) in order to produce a product (students) better suited for changing markets (global environmental change). At the same time, we would use our plants (campuses) to model our message. A former corporate executive who now teaches at Clemson says, "universities don't work like corporations. They work more like loose agglomerations of independent entrepreneurs, drawn together by common interests." Consequently, we determined that our most effective approach would be to try many things, at many levels of university life, with the hope of institutionalizing those ideas that were successful. Not every strategy works the same at each institution. Each project is, in essence, an experiment. Our approach includes linking sustainability to

teaching and research, improving campus environmental performance, and forging links with the larger community. We focus on our efforts as a catalyst, minimizing credit due to SUI, and maximizing the role of cooperating units, in the belief that this will foster institutionalization of an idea.

Teaching and research

Faculty are encouraged to enhance their understanding of sustainability by attending conferences and workshops and to enhance their students' understanding of sustainability by adding material to existing courses or by developing new courses. For example, a professor at MUSC has added elements to the pediatrics program to ensure that new pediatricians will have a better understanding of environmental threats to children's health. At USC, the initiative has facilitated the hiring of an environmental ethicist, who helps students from a variety of majors consider the full effect of decisions they may make, both now and in the future. Many faculty members in disciplines ranging from art to chemical engineering have taken advantage of SUI resources to develop new courses and/or to add new elements to existing courses.

The most exciting of these courses have combined academic learning with service to the larger community, either on campus or in the surrounding community. At Clemson, faculty in English and Horticulture combined forces to design outdoor environmental classrooms for several local schools. Students in technical writing classes then prepared sample grant requests to be used by school personnel, parents and teachers to request financial assistance in developing the classrooms from local businesses and community organizations. Students in all the classes enhanced their understanding of the environment, their community, and the academic skill they were expected to learn. At the same time, they acquired "real world" experience. USC personnel have, in turn, developed curricula to aid teachers in tying experiential outdoor learning to the state's new science standards [2].

At USC, we supported the development of nine special environmental sections of English 101. In addition to focusing their reading and writing on environmental issues, students were required to complete a significant amount of community service. Students in the course provided approximately 2200 hours of community service for thirty community and campus agencies, then wrote papers reflecting on their experiences.

There is an old joke along the lines of "the world has problems and universities have departments." One of the goals of the Sustainable Universities Initiative is to bring members of many departments together to focus on "problems." We have sponsored a number of focus groups and workshops designed to bring faculty together to focus on a particular issue. One of the most unusual of these groups unites pharmacists interested in the proliferation of herbal and "natural" supplements with agricultural scientists looking for high-yield replacements for tobacco, plant physiologists exploring the mechanisms by which natural remedies work, and ethnobotanists interested in how humans have used, and continue to use, medicinal herbs. The opportunity for interesting interactions was epitomized by a long conversation between the dean of MUSC's School of Pharmacy and the Traditional Medicine Advisor to the Catawba (Indian) Nation at a workshop in the fall of 2000.

Other conferences have addressed urban ecology, environment and health, and, for administrative and operations personnel, "green" building in higher education. The latter resulted in commitments from several member schools to create a "green"

building certified by the Leadership in Energy and Environmental Design (LEED) program administered by the U.S. Green Building Council. Smaller workshops have included a seminar for faculty interested in incorporating environmental ethics into the courses they teach and a "train the trainer" workshop to help science faculty teach prospective K-12 teachers more effectively.

We have also made small awards to help faculty initiate research projects that will eventually further the cause of sustainability. Examples of these projects include solar treatment of non-point pollution, improvement of septic tank and soil absorption system performance, development of fuel cells for on-campus applications and exploration of the use of CO_2 as a cleaning agent in hospitals, carried out jointly by researchers at USC and MUSC. Several of these seed grants have already resulted in published papers and new extramural funding.

We recognize that much of a student's higher education takes place outside the classroom. Consequently, we encourage student projects, bring provocative speakers to campus, and focus student attention on issues related to sustainability through awards and special events. We also encourage volunteer efforts related to sustainability. Examples include campus-based activities such as assisting in collecting end-of-term discarded items for charitable organizations, organizing recycling at football games, and community-based efforts such as stream and river cleanups.

Campus housing provides an ideal opportunity for informal education about sustainability and responsibility. Residence hall advisors are expected to encourage recycling and conservation of water and energy. USC (Koman, 2001) and Clemson (NWF, 2002) have both initiated concerted efforts to collect material from students at the end of the semester—material that, regrettably, would otherwise go to landfills. USC's effort, in its second year, collected a considerable amount of usable clothing, food and other materials, all of which were distributed to local charities (Table I.) USC Housing's Environmental Manager reported "great improvement with both a significant level of re-use by students of cinder blocks, a significant reduction in disposed waste, and an increased level of donations of food, clothing, and small appliances. Our goals of more product reuse and less give away and disposal have been exceeded."

Campus environmental performance

Universities would be hypocritical if faculty taught students one approach in class while administrators demonstrated another on campus. Our goal is to make campus operations models of good practice, serving as examples for students to emulate when they move into positions of authority.

Building on the theory suggested in the National Wildlife Federation's *Ecodemia* (Keniry, 1995) and other publications, SUI encourages the use of the campus as a laboratory for testing classroom lessons. Students perform a useful service for the university while they gain practical job skills. One example of this dual-purpose activity is the development of campus environmental management systems (EMS). We are working on a model campus EMS that will fit well with the unique structure of university management, which is less hierarchical and more decentralized than that found in a typical business. Students have been involved in making initial assessments, aspect and impact evaluation, and internal audits. USC's Environmental Health and Safety Division has completed its first audit [3], and is now working to help other campus units develop compatible EMSs. At Clemson, the EMS effort began in an

academic unit, but it is expected that the Environmental Health and Safety Division will take the lead on that campus as well. SUI has also supported the establishment of a lead auditor course for graduate students. Students learn both theory and practice through classroom experiences as well as work in industry.

Other "campus laboratory" projects include efforts as disparate as landscaping and building management. A Clemson graduate student is developing model campus landscaping guidelines (which should be applicable to any large institutions. A USC geography student identified a number of areas on campus where turf could be replaced with mulch or ground cover then calculated the savings in manpower, equipment and gasoline. Students in classes ranging from engineering to geology have performed building audits and made recommendations for resource (and money) saving improvements.

Each of the three universities has an Environmental Advisory Committee. Not surprisingly, all three universities are focusing on reducing energy use and costs. MUSC's President recently charged a committee with identifying ways to reduce the school's energy bill by 30 percent. USC has developed an energy policy to complement technical changes that saved the university more than $700,000 last year. Clemson initiatives include development of an Energy Systems Laboratory (with the S.C. Institute for Energy Studies) that will use Clemson's working energy systems for education, research and training.

Environmental advisory committees are not limited to consideration of energy management and conservation. Because they are one of the few groups on campus that include faculty, operations and administrative staff, and students, they provide unique opportunities for improving understanding and sharing information. For example, as a result of conversations between USC's Director of Housing and facilities managers who oversee water and energy use, water and energy saving washers were installed in all residence halls. The change is projected to save the university approximately $20,000 per year (Luna, 2001.)

SUI has been able to facilitate a number of pilot projects to make campus operations more efficient. Examples include the establishment of a vermicomposting operation at MUSC, which uses two 8-by-5-foot bins of worms to convert up to 250 pounds of food and newspaper waste per day into fertilizer for the grounds. MUSC has also piloted the use of waterless urinals, which can save significant amounts of water by eliminating up to 1.5 gallons for each flush of a conventional urinal.

Community links

Universities exist to serve the needs of society, broadly defined. Thus, it is important to make sure that work related to sustainability within the university community is closely linked to that of university "clients" — those who hire our students and put our knowledge to practical use. In cooperation with the S.C. Energy Office, we have established the S.C. Sustainability Network, a loosely knit group of organizations with an interest in some aspect of sustainability. Network participants are notified of relevant conferences and speakers and are invited to come together periodically to share information and ideas. We've also created a "sustainability in action" link on the S.C. Sustainability Network portion of our Web site (www.sc.edu/sustainableu) to showcase the reality behind the rhetoric.

Many faculty members encourage students to work with community organizations in order to gain experience in solving problems related to sustainability. For example, horticulture and landscape architecture students collaborated on creating "sustainable landscaping" for a Habitat for Humanity community in Pickens County, near Clemson. The site was the first Habitat for Humanity residence certified by the National Wildlife Federation's Backyard Wildlife Habitat program.

Similarly, students from engineering and media arts at USC asked Habitat for Humanity residents what they liked and disliked about their homes and what they would hope for in a community. Based on that information, the students designed a menu of options to make Habitat for Humanity homes and communities more "sustainable." Several "green" Habitat homes have been constructed in Columbia by United Methodist churches using materials and technologies suggested by the student group.

Clemson architecture and planning students have worked with the community to design new living spaces in downtown Asheville, NC, to plan for reuse of an old school, to study light rail in the Greenville, SC, corridor, to design an environmentally appropriate highway interchange at the Sandhills site in Columbia, SC and to assist in planning for the City of Clemson's recycling center. America Reads at Clemson, a federally funded program, has partnered with SUI to make sustainability the focus of its efforts. University students who tutor K-3 students used environmentally themed material to teach reading and have started working with the younger students to restore a stream damaged by construction of the new school.

In coming years, we hope to focus more on links with industry. Many industries and businesses, particularly those with international connections, are familiar with the concept of sustainability and have incorporated it into their thinking at multiple levels within the organization. We believe we can use this to our advantage, sharing the educational mission with the industrial sector. In addition, we hope to refine our approach to education, helping our students effect change at the government level, fostering civic responsibility by community groups, and promoting personal responsibility for environmental improvement. We owe the planet nothing less.

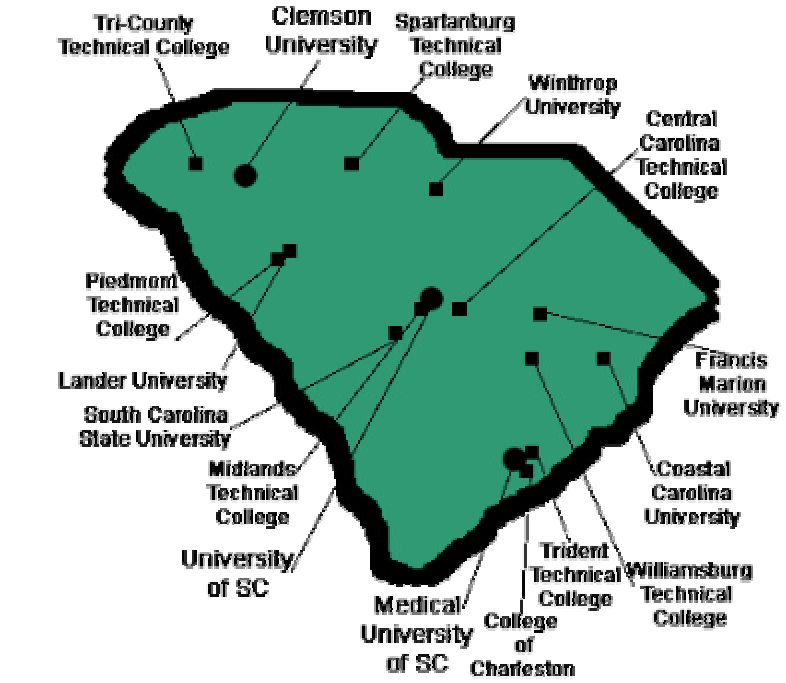


Figure 1: SC Sustainable Universities Initiative Member Institutions

Table I: Material collected during end-of-year "move outs" at USC

	2002 Collection	vs.	2001Collection
Food	1480 pounds (.74 tons)		980 pounds (.49 tons)
Clothes	8020 pounds (4.01 tons)		7820 pounds (3.91 tons)
Appliances/ Toiletries	1100 pounds (.55 tons)		1000 pounds (.5 tons)
Cement Block	63000 pounds (31.5 tons)[a]		83400 pounds (41.7 tons)a
Wood	500 pounds (.25 tons)[a]		600 pounds (.30 tons)a
Totals	74,100 pounds[b] 37.05 tons		93,800 pounds[c] 46.90 tons

[a] In 2002, there was a concerted effort to encourage students to retain building materials for future use, causing a significant decrease material collected by weight. Weight of food, clothing and appliances, on the other hand, increased.
[b] 33,682 kg
[c] 42,636 kg

Endnotes

[1] Sustainable Universities Initiative, Affiliate Schools, available at www.sc.edu/sustainableu/PhaseII.htm.

[2] S.C. Department of Education State Science Standards, available at http://www.myscschools.com/offices/cso/Science/Sciencest.htm

[3] University of South Carolina Department of Environmental Health and Safety, available at www.ehs.sc.edu.

References

Eagan, D. and Keniry, J., 1998, *Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses*, National Wildlife Federation, Washington, D.C.

Keniry, J., 1995, *Ecodemia*, National Wildlife Federation, Washington, D.C.

Koman, M, 2001, "Take it or Leave It", *College Services*, National Association of College Auxilliary Services, pp. 22-25.

Luna, G., 2001, "Ripples in the Water", *College Services*, National Association of College Auxilliary Services, pp. 18-19.

National Wildlife Federation Campus Ecology Yearbook, http://www.nwf.org/campusecology/greeningprojects.cfm.

S.C. Department of Education State Science Standards, http://www.myscschools.com/offices/cso/Science/Sciencest.htm

Sustainable Universities Initiative, www.sc.edu/sustainableu.

University of South Carolina Department of Environmental Health and Safety, www.ehs.sc.edu.

Return to Contents

9. The recent history of waste management in the sub-saharan Africa : The case study of Emmaus International Prject.

Kouassi Sebastien Dohou,

Kouassi Sébastien DOHOU, Géographer-Communicator
03 BP 1912 Jéricho COTONOU - République du Bénin
Tél (00229) 021836 Fax : 229 30 38 15, e-mail : Kdohou@hotmail.com

INTRODUCTION

The general crisis of the eighties accelerated everywhere in sub-Saharan Africa, the Government resignation in the urban waste management, this situation has brought out the creation of several association and community corporation which aim generally at solving the problem of urban environment degradation. It is during this urban crisis period that began in Porto-Novo, capital city of the Republic of Benin, 250.000 inhabitants, a new experience in urban waste management by compost technical with the Non Governmental Organisation "EMMAÜS INTERNATIONAL". The waste collected is thrown on the way and treated according to an integrated approach : urban environment - economic-agricultural production.

SOME TECHNICAL DATAS

The increase of the population, the improvement of standard of living and the production have contributed to extend urban waste management in Africa cities and especially in Porto-Novo.
Urban waste management in this city poses clearly serious health and environment problems, mainly by their composition and perceptible aspect in the urban landscape .
The main infection and diseases caused by urban unhealthy in Porto-Novo can be grouped in three distinct categories :
(i) diarrhoea
(ii) parasitosis
(iii) malaria

The situation was worsened in the eighties when the municipal urban waste management services resignated and the sanitary situation deteriorated : the case of malaria has increased by 1165/year, parasitosis 9286/year. The wild rubbish tips were multiplied : 5 in 1960, 11 in 1980 and 27 in 1990. Then, it appears necessary to identify a new strategy to solve urban unhealthy problems in Porto-Novo. In that way, in 1989, the NGO'S EMMAÜS INTERNATIONAL implemented a project of collecting and valorising the urban waste in a field about 7 ha given by the population in a suburbs in Poto-Novo, called TOHOUE.

THE METHODOLOGY

It consists in collecting waste by going from doors to doors with carriage on payment of 1000 F CFA (about 1 dollar US) per month. The waste collected in Porto-Novo (about 20 m^3/day), is thrown, set to the village TOHOUE and treated according to a commercial and scientific view. The approach consist in successively developing household stamping activities, recycling non-organic waste from household (bottle, iron, bone and shell, glass …), waste water purified by macrophyte lagoonage (water hyacinth)… , and people education on these new activities.
The operating procedure consists in :

(i) hand picking of waste and recovering vegetable and animal waste for doing swath
(ii) re-covering the swath with branches
(iii) following up the swath in controlling the temperature and humidity (65° for a good quality of the compost)
(iv) watering frequently the swath and returning it out six weeks after
(v) doing maturity and fermentation control six weeks after retuming
(vi) finally passing the compost through a sieve and pick out the non-organic waste.

So, the compost which is obtained could be used for market-garden, maize, cassava, and so on production and planting certain trees which contribute to the biologic wrestle against "the enemies of the crops"(insects).
Basically, any element for the production line is not neglected finally. All the line of the production are connected and the compost is on the centre of the system :

(i) The waste water treated by marophyle lagoonage is used to watering the swath ;
(ii) The compost produced is used for market-garden and planting ;
(iii) The plant derivatives are used for the biological insecticide production and for feeding ;
(iv) The dung(from cattle) and the dead leaf are used for the compost production ;
(v) The recyclable waste articles are recycled and sold ;
(vi) The non recyclable articles are used for the handicrafts.

Regarding the wrestling against the enemies of the crops, the practice consists in using leaf of different plants (tobacco, red pepper, papaw, …) to product biological insecticide.

Example :
(i) Boiling 500 g of red pepper in 3 litters of water until 20 minutes. Adding 30 g of soap and 3 litters of water. Let this melange water-cooled and filter. The produce could be used to wrestle against scorpiurus, ant-fly, fly, …

(ii) Boiling 200 g of tobacco leaf in 3 litters of water during 15 minutes. Adding 30 g of soap and 3 litters of water. Let water-cooled and filter. The produce could be used to wrestle against scorpiurus, ant-fly, fly, …

RESULTS AND CONCLUSION

This experience from EMMAÜS INTERNATIONAL, a specific example in sub Saharan Africa, has rapidly proved to be the best solution of urban waste management, cities improving of sanitation, agriculture development and employment creation. This oriented research initiative integrates the higher education programmes new vision in the sub-Saharan Africa.

As a matter of fact, in the Sub-Saharan Africa, the major economical activity is agriculture and the sector uses more than 80% of the population .But, the climate change the region is confronted with and the technology applied by the African farmers lead the Sub-Saharan Africa to famine, soil degradation, water pollution, … brief the environment problems. The situation constitutes a serious constraint of the sustainable development.

Then, it is important that the higher research being in the agriculture service in order to promote alternative and innovative solutions. in the most of the countries, the budget of States and the International Co-operation award more credit to the research programmes in the faculties of agronomy in order to improve alternative solutions. The tendency is the promotion of the higher Education oriented towards agronomy, environment with the orientation of the higher education programmes towards agriculture and environment and the re-allocation of research budget.

Today, there are more than 200 NGO's in Benin, training at TOHOUE, which collect waste in the cities in order to get job, and two majors other centres for waste treatment according to the compost technical.

In the continent, EMMAÜS-TOHOUE is a curiosity and a reference as far as training is concerned in waste potentialities according to a commercial and scientific waste valorisation in a sustainable view. This technical is not imported from industrial countries and is really adapted to Africa. It also concerns the economic operational insertion of the organic waste valorisation, in one hand in waste management, in the other hand in the agriculture production.

The "Centre de Traitement des Ordures Ménagères de Tohouè (CTOM)" raises up near to the public and the agronomy research oriented centre, a great interest. The quality of the compost produced in CTOM and certified by many European laboratories and the biological agriculture methodology applied have provided necessary to establish, in TOHOUE, the training centre called : **THE INTEGRATED BIOLOGICAL AGRICULTURE TRAINING CENTER(CABI).**

It is clear that the CABI was established to popularise this new environmental method of the urban waste management. To date, 323 training from many African countries were initiated to this compostage technical and the integrated biological agricultural practice at CABI.
Two training standard models are applied in the CABI : direct training and formative training.

SOMME TECHNICAL RESULTS

MODULE	TRAIN ING		PROVENANCE	TOPIC
	Year	Number		
(1) Integrated biological agriculture technical	1993 1994 1995 1996 1997	30 67 64 59 62	Benin, Togo, Ghana, Ivory -Coast, Mali, Burkina-Faso, Senegal, Cameroon, Congo, Haiti,…	- Household collecting and sorting - Market-garden - Animal husbandry - Waste water management
(2) Urban sanitation	1998	41		

The EMMAÜS-TOHOUE Project experience is now widespread in many African countries. It is used for waste management in the Republic of Cameroon, Ivory -Coast, Ghana, Togo, Mali, … and actually supported by UNDP and UE technical and financial assistance.

This experience succeeded in taking into account some factors :
(i) The people effective participation
(ii) The integrated character of the project activities
(iii) The possibility to create jobs from waste management.

KEY WORDS : Porto-Novo, urban waste, compost technical, integrated management, people participation, regional interest.

REFERENCES

1- Barton, C. ; Berns tein, J. and Leitman J. : Environmental strategies for cities : a framework for urban environmental management

2- AFTES- The Word Bank : Towards Environmentally Sustainable development in sub -Saharan Africa : A Word Bank perspective
Draft Discussion, 1995

3- DOHOU (KS), For a new approach to water drinking promotion in a polluted environment
Stockholm, SIWI 1997

4- MBIOLE(ML), 1996 : rapport de fin de stage
Emmaüs Tohoue, Porto-Novo

5- CTOM, 1999 : Rapport général d'exercice 1998
Emmaüs-Tohoue, Porto -Novo

Return to Contents

10. Sustainability takes time

Peter R. Downey,
Sheffield Hallam University, U.K.

As I left Lund University, at the end of EMSU 99, it was with a renewed sense of urgency and a recognition that the work we were undertaking at Sheffield Hallam University was a small but essential part of what really was a global initiative. The enthusiasm was refreshed. The knowledge that there were others following similar paths was a spur and that we could tap into that global network of experience and commitment a comfort. Maybe I was even foolish enough to think the task would be easier. I should have known better.

Three years have passed since those heady days. A lot of things have happened - in the U.K. higher education sector, at Sheffield Hallam University, to me – and it is an appropriate time to take stock. Many of the aspirations I had three years ago still have to be fulfilled but we have made significant strides forward in other areas. The agenda has also changed. Essentially, in 1999, we were thinking and talking "environmental" but now it is "sustainability" and I spend as much of my time talking about corporate social responsibility as I do about environmental objectives. This having been said, my immediate, emotional and honest response to the question, "How have things gone?" is an unequivocal "Not as fast as I had hoped." I wonder what your judgement will be.

What was the situation at Sheffield Hallam in the summer of 1999?

The University was contributing to the Forum for the Future's HE21 project, which was just starting the second of its two years. This was engaging us, with other environmentally committed institutions, in the consideration of environmental good practice and the introduction of environmental management within our own University. At Sheffield Hallam the only university internal 'working group' in existence was informal and, in reality, not part of the significant reporting structures of the University. Called the Environmental Management Advisory Group, it essentially was a self-appointed group of operational managers and members of the teaching community who had a professional interest in things environmental. The Initial Environmental Review of the operation of the university had been completed, significance determined and the first year's targets and action plan agreed.

So what has been accomplished?

In many ways, I believe the most significant element of progress has been the formalisation of the position of 'sustainability' within the university.

The Advisory Group has gone; replaced by a public, formal acknowledgement of where responsibility lies and a formal body, the Sustainability Implementation Group, with a role its name describes. The university's published Environmental Policy [currently

being redrafted as a Sustainability Policy] states; "The Pro Vice-Chancellor, Academic Development and the Director of Estates and Facilities are designated with overall responsibility for the achievement of the University's environmental aims. Responsibility is shared by the entire University population, at every level and across all Schools and Departments. All staff and students should be encouraged to recognise their potential contribution to the achievement of the University's environmental aims." The terms of reference of the 'Sustainability Implementation Group' are: -

1. To advise the University on matters of operational management in the promotion and achievement of the vision of Sheffield Hallam University as a leading 'sustainable' university in Europe.
2. To oversee a programme for the implementation of the University's Environmental Policy including the preparation of an annual Action Plan designed to achieve continuous improvement in the University's operational, environmental performance. This will include the responsibility for advising on priorities for action; appropriate monitoring of the approved Action Plan and the preparation of an annual report on the operational performance of the University for publication.
3. To identify the resources required for the implementation of the Action Plan and their incorporation within the Business Planning and Budgeting processes.
4. To promote cross School/Department/Section collaboration on issues relating to the environment and sustainability.
5. To promote the Sustainability Agenda within the University and to all the University's stakeholders.

The members of this Group, in alphabetical order of office, are Director of Estates and Facilities [*chair*], Energy Manager, Environmental Assistant, Facilities Manager Collegiate Crescent/Psalter Lane, General Manager of the Students' Union, Head of Business & Facilities Services, Head of Estate Operations, Head of Management Services, Head of Residential Services, Purchasing Manager, Health and Safety Manager, Special Projects Co-ordinator [*Chair in the absence of the Director of Estates and Facilities*], a nominated 'Sustainability Co-ordinator' for each of the other university administrative departments, and a representative of the School Managers. The School Managers are the administrators of our academic units, called Schools at Sheffield Hallam. The Group is tasked to meet as frequently as necessary to maintain continuous improvement in the operational performance of the University.

These changes, together with the agreement that the Vice Chancellor will submit a formal, annual report on sustainability to the Board of Governors, has placed the issue firmly into our corporate strategy. No longer is sustainability an optional extra, a luxury that is tolerated. Its consideration is a fundamental element in our business planning.

So what progress has there been in operational terms?

The 'Initial Environmental Review', completed in 1999, led to an agreement on the 'Significant Environmental Impacts' of our operation, the setting of targets for the year 1999/2000 and an action plan to achieve those targets.

At this point, it is worth stating that, at Sheffield Hallam, we developed our own methodology for the Review. It was developed, after considerable internal discussion, to minimise the amount of additional resource required to carry out the Review. Our method not only drew on the professional expertise and experience of our managers but also enabled them have a sense of ownership in the process, gaining their support not just for the initial activity but also for the long term outcomes.
I'm pleased to be able to report that we were largely successful in achieving the targets set in that first year. A quick look at some of the outcomes will be illustrative of the range of initiatives we undertook.

For construction projects, both new build and refurbishment, we revised the statement of requirements and basic design brief to incorporate sustainability; we revised our contractor documentation to ensure good working practice relating to noise and visual impact and waste disposal; we incorporated life cycle cost analysis into the decision taking criteria in the appraisal of proposals; we established procedures to ensure that sustainability criteria are included in all decisions for refurbishment or new build and we reviewed our existing practices against the current legislative requirements. We also adopt the BREEAM standard for new buildings and had appropriate estates' staff receive external assessment training.

Our action in relation to our energy usage included the introduction of awareness training in student induction programmes although this was one issue on which we failed in the first year. However, we did try to reach them through our 2000 Environment Week, called "Who wants to breathe clean air?". This was a new element in the university's calendar and, that year, focussed on developing an awareness amongst the existing student population of personal actions they could take to improve the atmospheric environment. Successfully, colleagues completed a property survey programme to facilitate energy efficiency measures on the second largest of our campuses. Overall, their work improved the energy performance for the university to enable a calculated reduction of CO_2 emissions from the July 1999 baseline by 3% in July 2000, and then a further 2% by July 2001 and another 2% by July 2002**.** Another target achieved was, in future, to be able to measure all water usage. This was done by December 1999. Also relating to our use of water, by March 2000 we had carried out all necessary work to ensure we were complying with effluent discharge standards and had developed and publicised strategies to minimise water usage by July 2000. A disappointing outcome was our evaluation of the potential to recycle wastewater in our residential properties. As a retrofit activity, it was clearly not financially viable.

With regard to the general maintenance of the estate, a preventive maintenance programme was refined to ensure the efficient working of all mechanical and electrical plant by September 2000. This was followed by the development and introduction of a comprehensive planned maintenance programme by September 2001. The Estates section also introduced, taking account of the available best practice for sustainability, a detailed specification of materials to be used and methods of waste disposal for all contractors working with the university.

The Initial Environmental Review had shown the significance of the impact of the university's paper use and a number of targets were set aimed at a significant reduction. So far some have been more successful than others. A target, which was flawed through the difficulty of monitoring progress, was to change the current culture of the teaching staff in the high consumption of paper through the provision of workbooks and lecture notes for students by changing them from a printed form to an electronic form. This work is ongoing and is related to our e'learning initiatives but the related reduction in paper used is virtually impossible to monitor. A lesson learned about 'smart' targets! A similar problem existed with our targets to reduce distributed copying by 10%, dependence on paper within the office and the amount of "over-ordering" on print runs all by September 2000. Having hopefully learnt this lesson, our target for 2001/2002 is to reduce the amount of paper purchased by the Print Unit by 10 %. This can be measured and monitored!

Returning to paper in 1990/2000, we did meet our target to ensure that all our supplies of toilet tissue were of a non-bleached, recycled product and we exceeded our target to introduce office paper recycling throughout the City Campus by September 2000. By that date, it had been introduced throughout the university as well as the recycling of magazines and newspaper.

Progress around the issues of procurement were disappointing as the only target achieved was the revision of the university's financial rules to enable us to take into account sustainability issues, in particular life cycle costing analysis, in all our purchasing decisions. The review of our ordering process to ensure that sustainability issues have been taken into account is taking rather longer than the deadline set of September 2000. The investigation of the university's potential to develop a market for products based on recycled materials continues and a big step is that, since the summer of 2001, we are now able to say that our normal paper of choice is a 100% post-consumer waste recycled paper. Even so, there are still problems to be resolved which mean that not all our paper purchased falls into this category. We also continue to evaluate e-commerce options to reduce paper consumption in the ordering process. Our aim also was to start work, in January 2000, with the University's supply chain to assist the development of waste minimisation but this still has to be started.
Only slightly better has been our attention to waste management. We achieved the target of analysing our waste stream and identifying the changes that needed to be made. However, it became apparent, for a number of reasons, that we needed to appoint a new waste contractor from September 2001. This was a wonderful opportunity to introduce some good practice but, unfortunately, it also became the reason for not introducing some changes earlier. The result has been no significant targets were set until the current year in which we plan to achieve a reduction of 20% in waste sent to landfill. Another important step has been the introduction of payment, to the contractor, by weight of waste, rather than by volume, and the provision of detailed management information. However, we did recognise that, as we would be working in partnership with the new contractor, our strategy and success would be conditioned by that relationship and all has not gone smoothly.

This brings me to the area in which progress has been the slowest, all matters relating to transport. This is particularly disappointing as, in my presentation at EMSU 99 (Downey, 1999), I talked about "the critical significance of the impact of transportation". I believed then, as I still do, that transport issues "will eventually prove to be the dominant element in our thinking, policy and performance". Some things have been achieved but the significant elements of our integrated transport policy still remain to be implemented. A major problem has been the lack of an internal political strength to tackle an issue all know to be highly sensitive.

What have we done? We have, to some extent, improved the visual impact of university car parks. We have purchased an electric vehicle to deliver the internal mail on City Campus, our main campus located in the heart of the City of Sheffield. In each handbook of a university vehicle, we have specified the precise fuel to be used in that vehicle. We have increased the provision for bicycle parking on all our campuses.

But, we still have not implemented the Integrated Transport Policy and certainly not by September 2000, as we had hoped. We also failed to meet our target to reduce the number of free parking spaces available to university staff on university campuses by 10% by the same date, or since then! Now the expectation was that we will have implemented a management system mainly based on metered, time restricted, pay-and-display by September 2002 but, even as I write, this date has been postponed until March/April 2003. Will we ever grasp the nettle? Indeed, I believe it will happen only because the university will be required to take appropriate action to enable us to obtain essential development planning approvals from the City Council.

So that is the story of the immediate results which came, in ISO 14001 language, from the Initial Environmental Review. Since then what else has happened at Sheffield Hallam?

A major event occurred in 2001 when the University was invited to be one of the partners in a new initiative, funded by the UK HE Funding Councils and led by the Forum for the Future – the Higher Education Partnership for Sustainability (HEPS). In their words, HEPS "is a pioneering collaboration between the Forum and 18 UK Higher Education Institution (HEIs). It's purpose is to help them deliver their own strategic objectives through positive engagement with the Sustainable Development agenda and to share that experience across the sector." It is a three-year, UK-wide initiative. The concept is that universities "can make a significant contribution towards Sustainable Development through their key roles as:

- **places of learning and research**; forming and informing the leaders and decision-makers of the future,
- **major businesses;** where prudent resource use not only saves money but safeguards reputations,
- **key community players;** as employer, purchaser and amenity provider with a major impact on the wider world of influential ideas and technological development."

The project combines "individual programmes of work tailored to each partner's priorities, partnership-wide capacity building activities and a systematic approach to

communicating outcomes to the sector and beyond. Work to date includes integrating sustainable development into the strategic planning process, addressing estate management priorities (particularly new build and refurbishment plans), purchasing policy, transport plans and the curriculum (with a focus on business, engineering and art and design). You will be able to access all you need to know by visiting the project's website at www.heps.org.uk

The real importance of this, from my perspective, is that the engagement with others and the discipline of needing to report to an external agency are the necessary spur to keep up the pressure to make progress. The other significant advantage is that, as the contract was signed by the Vice-Chancellor, the funding from our Funding Council and our matching contribution largely my time and input, these facts can be used as significant leverage, internally, to gain the support and co-operation of colleagues.

Another important stimulus for myself was an earlier visit, in March 2000, to Atlanta, Georgia USA. The meeting was a Southeast Regional Workshop organised by Second Nature with the title 'Shaping a Sustainable Future: Best Practices in Higher Education'. I do not think I would have gone if it had not been for the USA delegates I met at EMSU 99. They had opened my eyes to the work which was going on in the States and I thought both my university and I would benefit from my attendance. A thought which turned out to be a reality.

One of the features which impressed me at that Workshop was the contribution students, in the States, were making to the development of the sustainable agenda on campus. This has not been my experience in the UK but now is not the proper time to explore the reasons for this. However, shortly after my return from America, when a small group of students at Sheffield Hallam approached me with the challenge that the university was not progressing the environmental agenda as quickly as they would wish, I remembered what was happening on the other side of the Atlantic. So I agreed to meet them, first their spokesperson and then the group. Again I was disappointed as there were only four of them! I also found it interesting that they had one thing– apart from their course – in common. They were all mature students. I still believe that was significant.

What was the outcome of this meeting? Not so much in real terms, except I managed to arrange for one of them to come and work with me over the summer and later as a placement student. The disappointment to us all, that is the students and myself, is that we never managed to engaged any other students in any meaningful way. There is such a tremendous potential resource in the student body but the means of harnessing it still escapes me. Admittedly I have individual students carrying out projects that otherwise would have had to wait months or years until the resource became available but the political and physical support I found in the States still eludes me.

However, the student who came to work with me, prove to be a real plus. In her time working with us she achieved so much in addition to her specific workload, which was to develop our recycling and to organise the first ever Environmental Week. Her work and presence in the Facilities Directorate was an obvious demonstration that the university was taking sustainability issues seriously. No longer was it simply a matter

of myself, an enthusiast, continuing to develop policy and exhort others to change their way of thinking but here was the university actually doing something very visible.

What else have we achieved in the past two years?

Now, Catering Services provide milk in jugs rather than in those ubiquitous individual plastic cartons. My energy colleague, working with the Schools of Engineering, Construction, Science and the Materials Research Institute, has implemented a number of initiatives to minimise the use of water in laboratories and, in particular, research projects. As part of our 'estate strategy' we have continued to reduce our physical footprint which has a whole range of positive advantages including a reduction in our transport demand. Within the Facilities Directorate, we have introduced a culture which encourages the use of the laser printer to print on both sides of the paper. We have introduced double glazing as a standard specification in all our residential refurbishments.

In non-operational matters, we continue to engage with others in the development of appropriate sector sustainability performance indicators and try to contribute positively to the UK higher education network through an active participation in the work of the Environmental Association of Universities and Colleges as well as the HEPS project. I am pleased that a colleague is the newly elected Secretary of the Association. She is the Facilities Directorate's Purchasing Manager, definitely not a person with 'environment' in her title but with a critical role to play in the achievement of a sustainable future for the university. We also continue to work closely with and within the Sheffield community, involved in both the City Council's Cycling and Pedestrian Forums and their Waste Strategy Development Group as well as being members of wider community based groups. This we believe is a positive way in which we can make a real contribution to the community of Sheffield at a wide range of levels.

Corporate social responsibility in action.

Indeed, we consider our formal involvement in the community, and that of our staff in a voluntary capacity, sufficiently important for us to undertake a mapping exercise to find out and record how and where members of staff are engaged with the community. We have asked them to tell us how they are involved in the following categories and will make the same request on an annual basis. This information, held on a data base, will be evaluated to help determine if our support and encouragement for this sort of activity is being effective. The categories of engagement we have defined as:

- **Strategic community partnerships**: these are partnerships which play an important role in the economic and social development within the region and city. Meetings are focused on strategy and are held at senior management level.
- **Joint ventures/partners in the community**: these partnerships are formal and involve work on behalf of the Facilities Directorate on collaborative projects within the city boundaries. Meetings are held with relevant managers and may focus on strategy and operational issues.

- **Networking partnerships in the community**: these relationships exist to provide networking opportunities for university managers within the local

community and the region and should be to the mutual benefit of the community and university. It will also inform the Directorate's risk management strategy.

- **National and international partnerships**: these relationships exist to develop the positive position and the image of the University, and to provide network opportunities which have the potential to be of value to all concerned.

- **Indirect relationships**: this group identifies staff membership of community groups not directly associated with the university, but which may provide mutually valuable links. They might even create future business opportunities. It is this group which clearly indicates our staff's engagement within the community. They have volunteered themselves into these positions. It is part of our emerging, internal strategy is to reward them for their initiative and commitment, to encourage and support them in their activity. This is the group we will monitor most carefully to determine if our 'reward' policies are working.

We also believe that as well as identifying existing relationships, this policy will help to identify strategic and operational gaps where opportunities might usefully be explored.

As with so many initiatives, much of the benefit for individuals and the organisation arise from actually undergoing the process. The important gains are found in the initial thinking and subsequent discussions. If universities, or any organisation, are to measure their relationship with their stakeholders, as well as understanding whom they are, there is a need to give detailed thought to how the various activities impact upon them.

In fact, the University is represented on all the significant organisations working in Sheffield. This is relatively normal practice in the U.K. and not specific to Sheffield Hallam. Has anyone ever evalu ated that contribution? Should we simply accept the invitation to participate as acknowledgement of the fact that the external world values the Universities' potential contribution?

In a paper published earlier this year, (Downey, 2002) I suggested there was an "essential need for a stakeholder dialogue. Not solely a dialogue with those who are clearly identifiable and easy to reach; but one with the whole spectrum of the community with whom there is a potential interaction. It must be a dialogue with the informal civil society organisations such as neighbourhood groups and social movements which emerge from a 'bottom up' process, as well as with the more 'top-down' formal civil society organisations both governmental and non-governmental. It will not b e easy but it should be rewarding. It should not be done for the sake of gaining an accolade but because it is believed to be fundamentally important. It should be because our mutual interdependence is recognised."

Unfortunately last year, I observed at an international symposium in the Netherlands that there were academics "whose preference was to engage in philosophical debate rather than addressing practical means of attaining a goal." Their position might be tenable. "However, it is critically important that those who recognise and advance the

concept of corporate social responsibility and the ethical issues involved in sustainability, address the practical challenges to be overcome in the implementation of these theoretical concepts."

So what will be in the next instalment of this story?

The university's green transport plan or integrated transport policy will have to be approved and I expect that to happen before I return from Grahamstown. Approval will result in a lot of work to be carried out by colleagues but they will be ready to meet that challenge. My own agenda will be to continue working to ensure that issues relating to the environment and society are fully integrated with economic considerations in the determination of our corporate strategy. The environment and society are not optional extras. The ideal remains for all managers to be environmental managers in the same way that they are responsible for quality. It is simply another factor for a good manager to take into account, just part of their routine activity. It is critical for all staff to take ownership of the changes which are needed or there is little chance of success.

To help all my colleagues, in March 2002, I drafted a "Sustainability Checklist" which we are currently discussing. The concept is that the list should be available to everyone and, as part of their business and action planning, they should always ask these questions and score their response. As I say, it is still draft but has been agreed in principle and the list seems to be an appropriate way of concluding this story.
Will your decision/project….

- provide employment and training opportunities that support the needs of local workforces?
- provide any business opportunities which support environmental goods and services?
- incorporate environmental management to increase business competitiveness?
- provide satisfying and fairly paid work?
- use local goods and services wherever possible?
- offer new opportunities for learning and training?
- increase awareness and understanding of sustainable development?
- provide a service, facility or product that is accessible to everyone including those with disabilities?
- maximise opportunities for access to services by staff, students and visitors by encouraging public transport use, cycling or walking?

- safeguard and take opportunities to promote people's physical and mental well-being?
- contain or reduce air, water or land pollution to levels which do not damage natural systems?
- take into account the possible impacts of climate change?
- minimise noise and light pollution?
- manage demand for energy and water and contribute to their efficient use?
- create opportunities for the use of renewable energy?
- minimise the need for raw materials and minerals?
- conserve land and soil resources?
- reduce the risk of flooding?
- protect and enhance biodiversity, for example by planting native species and providing other habitats for wildlife?
- minimise the use of chemicals which are harmful to living things in the environment?
- help to minimise the university's production of waste?
- reuse or recycle waste materials?
- involve the use of recycled products?
- minimise the fear of crime?
- enhance local diversity and distinctiveness by respecting local character and using local skills, materials, produce and creativity?
- promote opportunities for recreation, art, culture and heritage?
- allow everyone to become informed and involved in decision-making?
- above all, will your decision/project take a long-term perspective, taking into account the needs of future generations as well as our own?

In the words of Mahatma Gandhi, "Be the change you want to see in the world."

References:
Downey, P.R. (1999), “Towards an Integrated Transport Policy in a University Setting”. The 1999 Eco-Management and Auditing Conference Proceedings, pp. 97-106
Downey, P.R. (2002), “The Essential Stakeholder Dialogue”. Corporate Social Responsibility & Environmental Management, Vol. 9 No. 1 pp.37-45

EMSU 2002 Conference

Peter R. Downey

An autobiographical note

Special Projects Co-ordinator at Sheffield Hallam University, U.K.

City Campus, Howard Street, Sheffield S1 1WB, UK
Telephone +44 (0)114 225 4919
Fax +44 (0)114 225 4948
E-mail p.downey@shu.ac.uk

Peter Downey is a Fellow of the Royal Geographical Society, Member of the Institute of Facilities Management and of the Faculty of Building. In addition to his position at Sheffield Hallam University, he is currently Chairman of Convocation and a member of the Council at the University of Sheffield and President of the Sheffield & District Chamber of Trade.

Return to Contents

11. Global environmental planning at the Technical University of Catalonia.

Didac Ferrer-Balas

Technical University of Catalonia, Barcelona, Spain

Environment Plan Coordinator
Technical University of Catalonia
C/Jordi Girona, 1-3 – Ed. A0 - 08034 Barcelona, Spain
www.upc.es/mediambient
coord.medi.ambient@upc.es

Abstract

The Technical University of Catalonia (UPC) adopted an Environment Plan in 1996, with the aim of introducing the key environmental issues into all university activities. This involved incorporating environmental and sustainability topics into classical technical education, promoting multidisciplinary environmental research and improving the environmental performance of university life as a whole. The first Plan (1996-2001) has just been completed, and the encouraging results and consequences have been the main motivation for the design of a 2nd Environment Plan for the period 2002-2005.

This paper aims to briefly explain the first Plan and show its results, with a discussion on the positive and negative aspects detected during the implementation of the Plan, and to present the second environmental strategy for the coming years.

As will be explained below, UPC has chosen to adopt a comprehensive environmental approach, which is why in this paper other aspects outside the strictly educational ones will also be considered. However, the paper focuses on the curriculum greening experience of UPC. Six years ago, this university decided to start greening its entire range of courses, which includes a wide range of technical and scientific areas. The majority of schools, faculties and departments of UPC have been working on the design and implementation of their own greening curriculum plan, and most of the activities carried out have been directly related to this action plan. Other actions have been given a more general focus. The most relevant projects are explained in the paper, in an attempt to evaluate their effectiveness in improving the overall environmental performance of our university.

1. Introduction

The first UPC Environment Plan (1996-2001)

Methodology

In November 1996, UPC approved the 1st Environment Plan (EP1) in order to introduce environmental commitments within the University, by adopting a general approach. As

can be seen in Table 1, the planning covered 6 major areas: Undergraduate education, Postgraduate education, Research, University life, Awareness Raising and Coordination. An accurate description of the Plan and its development can be found elsewhere [1].

The idea was not to create major new structures, but to get the existing structures within the University involved in the Plan's objectives [2]. In this sense, though there was a vicerector in charge of the whole Plan, each major area was the responsibility of a different vicerector. Additionally, a small office (Environment Plan Coordination Office) was created in order to coordinate and monitor the planned projects, through the publication of the annual Environment Report [3].

It is important to note that UPC has 35,000 students, with seven campuses spread across an area of 50 km around Barcelona, and 22 technical schools and faculties[6].

Projects included in the 1st Environment Plan

1. Undergraduate education
1.1 Greening of the curriculum
1.2 Subject "Introduction to the Environment"
1.3 Optional subjects with an environmental focus
1.4 Educational cooperation and final theses with environmental and 'green' businesses
1.5 Introduction to the study of environmental impact in final theses
1.6 Bibliographic collection on the environment in the libraries
1.7 Book "Greened problems in scientific areas"
1.8 Book "Environmental and Technology. UPC environmental guide"
1.9 Specific material for three subjects of major environmental impact

2. Postgraduate education
2.1 Map of postgraduate studies on the environment
2.2 Postgraduate courses with environmental content
2.3 Institutional links with environmental and 'green' businesses
2.4 Institutional links with the Administration
2.5 Greening of postgraduate courses (with emphasis on the doctorate)
2.6 Continuing education programmes for large enterprises and the Administration

3. Research
3.1 Map of environmental research
3.2 Promotion of environmental research workshops and seminars
3.3 Participation in the definition of environmental research framework programmes
3.4 Active participation in management bodies
3.5 Promotion of research greening
3.6 Comprehensive integration projects

[6] For the sake of simplicity, in the text "schools" refers to the 15 schools and faculties that belong to UPC, and also includes the 7 associate schools. These cover studies of architecture, mathematics, telecommunications, computer science, industrial engineering, civil engineering, agriculture, nautical studies, optics, knitted fabric engineering, business, etc.

3.7 Coordination centre for integration projects
4. University life
4.1 Energy auditing
4.2 UPC Campus transport study
4.3 Promotion of responsible transport
4.4 Selective collection of municipal (urban) waste
4.5 Collection of special (toxic and hazardous) waste
4.6 Collection of manuals to reduce environmental impact
4.7 Training and information courses for administrative and service staff
4.8 Environmental criteria in the design, construction and use of buildings
4.9 Environmental criteria in specifications
4.10 Environmental criteria in supply
5. Awareness raising
5.1 Support for UPC workshops aimed at awareness raising
5.2 Support for environmental business forums
5.3 Promotion of collective environmental guidance activities
5.4 Support for environmental volunteering
5.5 "Eco-tips"
5.6 Environment telephone number and e-mail address
5.7 Environment web-site
5.8 Internal communication of environmental information
5.9 External communication of environmental information
6. Coordination and monitoring
6.1. Support and coordination tools
6.2. Evaluation and monitoring mechanisms
6.3. Sponsoring and funding programmes

Table 1. Projects included in the 1st Environment Plan (1996-2001)

The main achievements of the EP1 are described below.

Education

The main and most ambitious objective in the area of education was the curriculum greening of all the subjects offered at UPC. To start working on this, the first step was to prepare a collection of manuals (one for each school or faculty) to assist students (and lecturers) in the introduction to the study of environmental impact in final theses. The second step was to involve the schools in order to produce a *School Curriculum Greening Plan* (SCGP) for each school, with what we call a "vertical approach" in the UPC context. These SCGPs had three main phases:

- to establish the profile of environmental knowledge that a student needs to learn
- to design the optimal greened curriculum
- to establish an action plan at school level

Apart from the lecturers of each school, the process for producing these SCGPs also involved professional associations and former students of the schools. They helped to establish a curriculum greening team (and responsibilities) in almost every school that produced one.

Once the main schools at UPC had produced the SCGP[7] (11 SCGPs were produced in the period 1998-2000), the next natural step was to work with the "horizontal structure" of departments[8], in order to produce a *Department Greening Plan* (DGP) for each one. Unlike the SCPGs, the DGPs covered not only CG, but also research and department life. The idea was to work with a structure closer to the reality of the lecturer, who, ultimately, is the key actor in the curriculum greening process. The main phases of the DGP were:

- to establish the basic environmental aspects that should define the department's actions
- to determine the priority greening lines at undergraduate and postgraduate education level
- to establish a short term action plan

To date, 18 DGPs have been produced, while 4 DGPs are currently being produced.

The quantity of information generated and the need to disseminate it through UPC and other universities and education centres has led to the development of the Virtual Resources Centre on Curriculum Greening in Technology[9] (e-ambiT).

Another important project was the establishment of a new subject: "Environment and Technology. Environmental Education in Engineering", developed in digital format (virtual learning), which is now being offered as an optional subject. This 60 hour course was coordinated by the UNESCO Chair for Sustainability at UPC, and besides its educational content, it also gives students the opportunity to participate in a virtual discussion forum on sustainability. More than 700 students have chosen this subject since September 2000. As explained below, UPC is discussing the possibility of making this subject compulsory for all UPC students. Also, the possibility of offering the course to other groups, such as university lecturers and secondary school teachers, is being studied.

Research

The main activities of the EP1 in terms of research have been developed through the establishment of an environmental research coordination unit (ERCU). The ERCU is responsible for several main tasks:

- to carry out a general analysis of the environmental research production of UPC (by mapping it and elaborating indicators)

[7] The areas in which no SCGPs have been produced are mathematics, computing and telecommunications.
[8] There are 40 departments at UPC. Most of them are located in more than one UPC school and are responsible for their lectures.
[9] The website can be found at: http://bibliotecnica.upc.es/e-ambit (Catalan version only at time of writing: May 2002)

- to act as a “hinge” between UPC research groups and organisations (public and private) which are interested in working with UPC on an environmental project/problem, basically establishing multidisciplinary teams from different UPC research groups
- to help reduce environmental impact and seek environmental applications for the research (other than environmental research) carried out at UPC
- to develop new environmental postgraduate courses

University life and awareness raising

Though many activities have been developed in this area, the most important are the establishment of Integ rated Selective Waste Collection Plans (ISWCP), and the introduction of environmental criteria in new buildings and campuses.

The ISWCPs have been implemented at school and/or campus level (depending on each situation), with a total of 13 plans having already been implemented, covering the entire UPC. In order to allow greater involvement of schools and campus management units, the responsibility was almost totally decentralised.

A second important project was to establish a methodology in order to ensure that each new building at UPC would fulfil environmental performance criteria. At the time of the approval of the EP1, the additional interest of this project was that UPC was going to build a new campus in 1999. For this purpose, the approach consistedof establishing the criteria first.

Coordination

The EP Coordination office was responsible for promoting the development of the EP1 projects, seeking external funding and evaluating and monitoring the development resulting from implementation. As a monitoring tool, an annual report was published, which includes the main indicators and a description of the most relevant activities carried out during the year.

Results of the EP1

Education

In terms of undergraduate education, an indicator was chosen in order to monitor the development of curriculum greening. This indicator is the percentage of courses which introduce environmental contents in their programme. A key-words list was established in order to be as objective as possible, and the information was checked from the annual publication from each school on the subjects being offered (study guide). As can be seen in Fig. 1, the trend is positive, though the growth is not as fast as expected. Although this is one of the main tasks of the EP Coordination office (this revision is very time consuming), one of the conclusions, as explained below, is that this indicator could be improved, since it cannot accurately reflect the complexity of introducing the concepts and values involved in sustainability into all the courses.

Since 2000, a new measure of progress in curriculum greening is being evaluated by means of a questionnaire carried out on the students who have found employment through the University's careers advisory office. Again, although two indicators are not sufficient proof, the trend seems positive (Fig. 2).

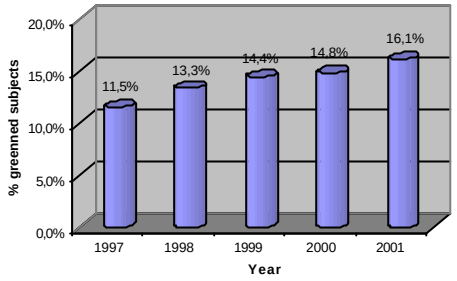


Fig. 1. Percentage of greened subjects.

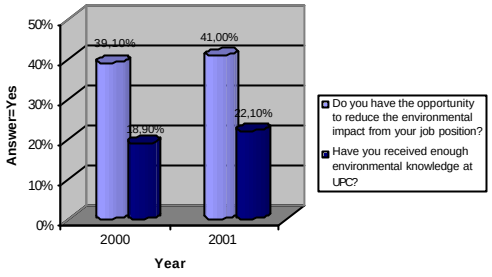


Fig. 2. Results of a questionnaire addressed to former UPC students.

As far as postgraduate education is concerned, efforts are made each year to monitor the range of courses made available by the University in environmental issues and the popularity of these courses. The indicator is the sum of the product of credit points of each subject (hours) multiplied by the number of students enrolled on this course. As can be seen, the trend is again positive.

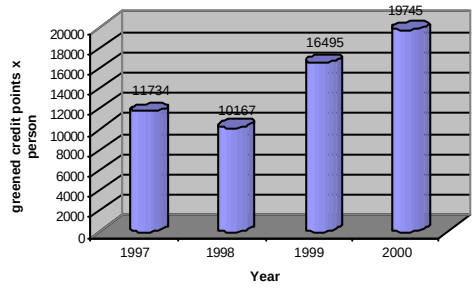


Fig. 3. Number of postgraduate environmental courses credit points multiplied by number of course students.

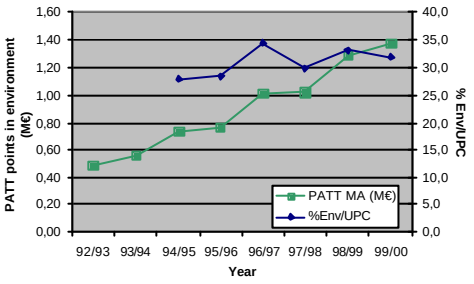


Fig. 4. (a) Technology transfer points (PATT) in M€ in environmental research; (b) Percentage of environmental research within total.

Research

One of basic "pillars" of UPC's EP is that the driving force behind introducing sustainability in higher education is research in environmental and sustainability issues (ER). Thus, monitoring these research activities was a priority during the

implementation of the EP1. As can be observed in Fig. 4, ER has grown substantially in terms of technology transfer, and represents approximately 30-35% of the total. The monitoring has also permitted the objective identification of fields of expertise related to ER, by dividing it into eight areas (Fig. 5). As can be seen, the main areas are the Water Cycle, Environmental Management in Industry, and Waste and Soil Contamination.

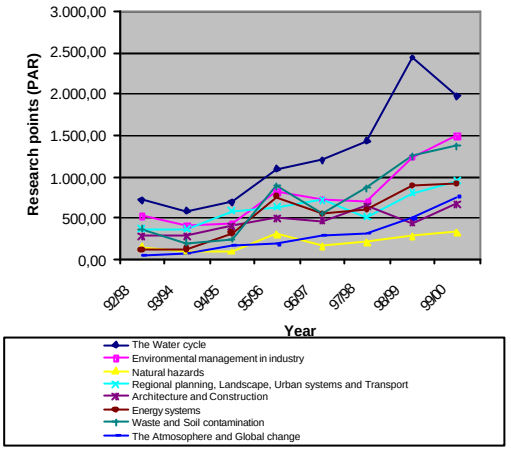
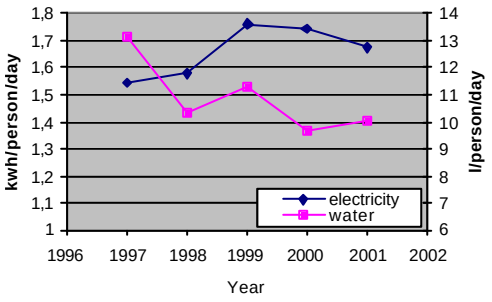


Fig. 5. PAR points (related to contributions to books, journals, conferences, etc.) in environmental research.

University life and awareness raising

Changes in water consumption per campus inh abitant are visible (Fig. 6), though it is difficult to attribute this trend to the existence of EP1. The same can be said of energy consumption. The changes induced thanks to EP1 are basically long-term (new buildings with sustainability criteria [4] are still a very low percentage among the total number of buildings, and will be so for many years). Improvements in awareness have been low to date, according to the questionnaires carried out.



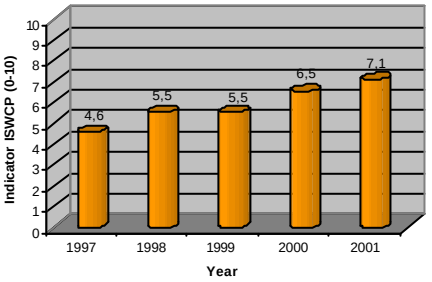
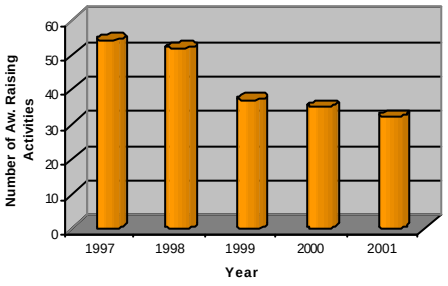


Fig. 6. Electricity and water consumption per year and university member (students+staff).

Fig. 7. Indicator of the Integral Selective Waste Collection Plans (evaluates qualitative and quantitative aspects of the implementation).

Other specific indicators, as shown in Fig. 7, reflect the positive evolution of the implementation of ISWCPs. This is a useful tool for monitoring the differences between the commitments of each unit with respect to waste management.

A significant evolution is shown in Fig. 8. This indicator is the number of awareness raising activities carried out at UPC on sustainability and the environment. This includes conferences (other than research focused), seminars, presentations, exhibitions, events, dissemination activities, etc., organised by students, departments, schools or other university units. As can be seen, their number has declined significantly. There are two possible explanations for this: firstly, as UPC has exhibited a strong institutional commitment towards the environment, there are now different and more important needs to address; secondly, environment and sustainability is no longer a fashionable issue among students. We believe that a combination of both reasons exists, and that this is an important issue to consider when implementing a new institutional programme.



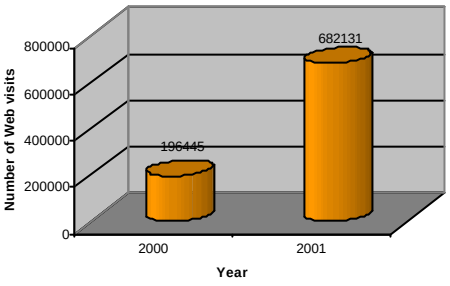


Fig. 8. Number of awareness raising activities carried out at UPC campuses.

Fig. 9. Number of visits to the UPC environmental website.[10]

Other indicators used are the number of visits to UPC environmental website (Fig. 9), and the number of people subscribed to the environmental e-newsletter (Fig. 10).

[10] http://www.upc.es/mediambient

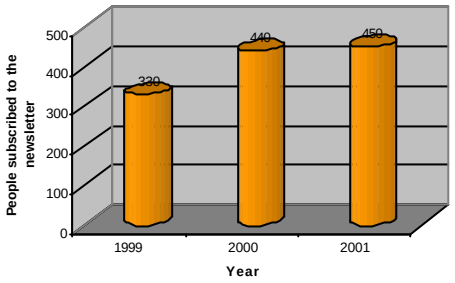


Fig. 9. Number of subscribers to the environmental e-newsletter.

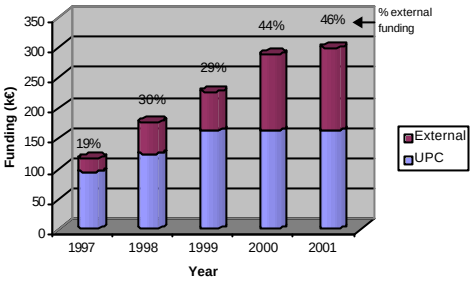


Fig. 10. Evolution of the funding source of the EP1 projects.

Overall evaluation (positive and negative aspects)

At the end of the EP1 (autumn 2001), an evaluation of the EP1 was carried out by a commission made up of 22 people from different university positions, all them involved in the implementation of the EP1, in order to determine its positive and negative aspects, and offer ideas and recommendations for the 2nd Environment Plan (EP2). The main conclusions of this evaluation were:

- The EP1 was correctly focused and has allowed UPC to become well placed in terms of greening, although some objectives need to be redefined
- The key point is the involvement of staff
- There is a lack of economic and human resources; external alliances would be a considerable help
- The organisational structure needs to be redefined in order to become more operative
- Processes in the area of University Life need to be professionalised and normalised

As far as undergraduate education is concerned, the conclusions are listed in Table 2.

Positive aspects	*Areas for improvement*
• To green all the studies at UPC was (and remains) a good option • Education is the main impact process in terms of sustainability • UPC is a pioneer (in our context) • Good tools have been developed • There is a hard core of able and motivated lecturers	• The concept "curriculum greening" must be redefined • Efforts must be made in areas where they will be most effective, i.e. during the periodical curriculum review of a school. • Reaching all lecturers, through the promotion of environmental courses and interdisciplinarity.

2nd Environment Plan (2002-2005)

Objectives and characteristics

The main characteristics of the EP2 are:

- Reduction of the number of projects
- Two-level operation
    - Reinforcement of consolidated projects
    - Starting up an open discussion/debate process in the mid term
- Greater linking of the areas (Education, Research and University Life)
- Intensification in communication efforts (internal and external)
- Seeking the real involvement of university community
- Seeking an efficiency, functionality and responsibility definition for each project and in overall terms
- Establishment of operational indicators for each project

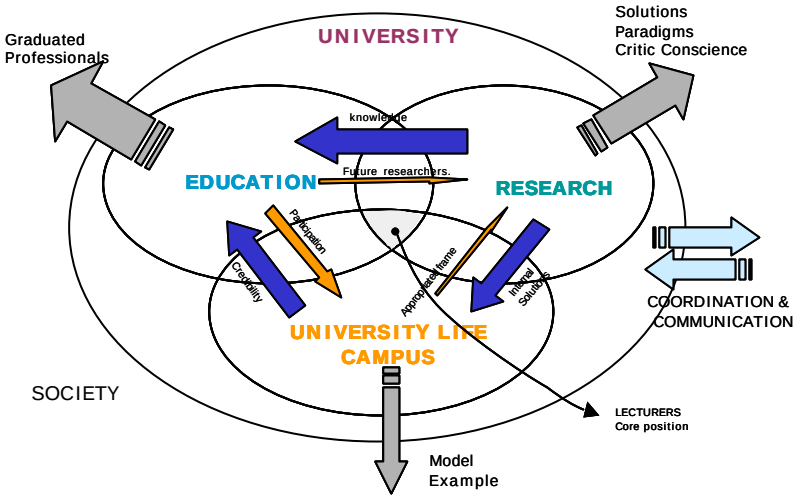


Fig. 11. The university's role in society with regard to sustainability in EP2.

Assuming that the role of the university with regard to sustainability may be interpreted as illustrated in Fig. 11, the EP2 is a tool that must allow:

- The reinforcement of UPC's commitment to sustainable development
- The involvement of the university community in the overall greening process of UPC
- The optimisation of available resources and possible funding

In order to contribute tothe sustainable development of society through:

- The integration of respect for the environment and the challenge of sustainability into people's education
- The intensification of research in scientific or technological alternatives in order to prevent and find solutions to the impact derived from the relationship between human beings and the environment
- The development of specific environmental management experiences that are exportable to society

Projects included in the EP2

Fig. 12 shows the 13 projects of the EP2, which are divided into 4 main areas.

In the Education area, the main project is curriculum greening in all disciplines offered at UPC (Project 1.1). The challenge is to apply the SCGPs designed during the EP1.However, it is also planned tooffer an elementary course entitled 'Sustainable Development and Technology' for all students. At the same time, UPC is opening the possibility of offering new environmental engineering studies in the coming years (1.2). In 1996, this possibility had beendiscarded in order to avoid any negative interference

in the curriculum greening of "traditional" studies. However, once this process has been initiated, it is felt that it will be of valuable help in creating a sustainability "critical mass" within UPC, rather than a source of problems. The third project is to start new environmental postgraduate courses (1.3).

As far as the area of Research is concerned, the ER Coordination Office should continue to act as a catalyst for new integrated and multidisciplin ary projects (2.1). One of the main targets is to train researchers to implement this multidisciplinarity working method in a new project of applied environmental research for UPC's own needs, called "Laboratori REAL" (REAL Lab) (2.2). This project aims to develop projects which will be undertaken at the new UPC campus in Castelldefels. Some of the projects in course are:

- Designing a sustainable mobility plan for the campus
- Developing energy indicators for monitoring building efficiency
- Limnological study o f the campus lagoon

Also in this area, the third project is to establish a doctoral programme on environmental studies (2.3), which would offer a multidisciplinarity approach and would help to consolidate and improve the quality of existing studies.

In the area of University Life and Campus, the projects are Waste Management (3.1), Green Building Design (3.2), Sustainable Transport (3.3) and Environmental Cooperation (3.4). This last project aims to involve students (willingly) in environmental projects, either at UPC or externally. The idea is to provide an opportunity to individual students who "want to do something for the environment", but also to establish a collaboration area between student associations, NGOs and other organisations, and UPC through the EP Office.

Finally, the area of Coordination and Communication envisages the internal and external communication of environmental projects and activities (4.1), to be active in networking and cooperating with other universities (around the world) as a key for SD learning (4.2), and to coordinate the whole Plan (4.3).

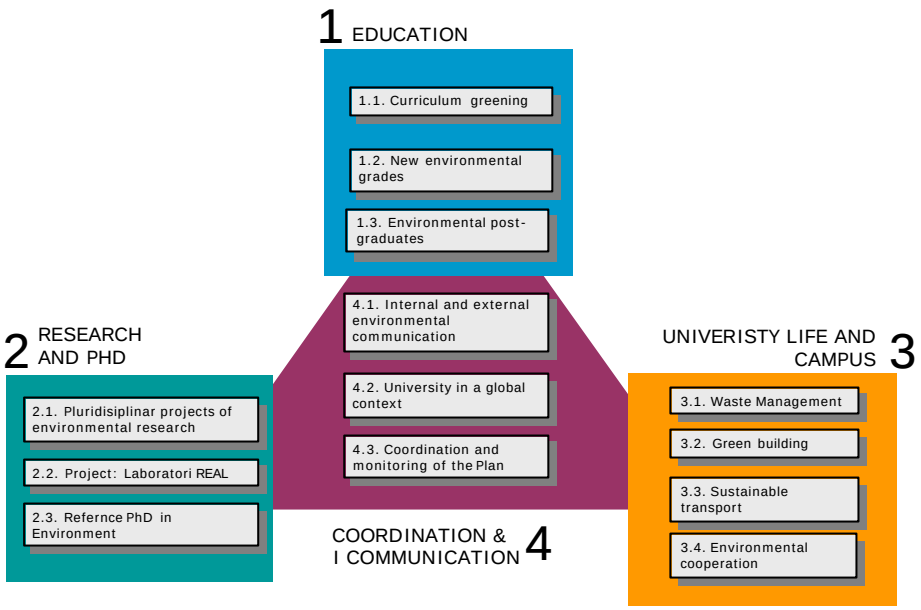


Fig. 12. Structure of the projects included in the 2nd Environment Plan.

Conclusions

UPC has gained valuable experience in developing an Environment Plan that has a comprehensive and integral perspective. Considerable efforts have been made in greening all university activities, obtaining significant and positive results. Indeed, the most ambitious objective of this planning effort has been, and remains in the 2nd Environment Plan (2002-2005), to educate people who will be actively steering toward sustainable development from their professional positions. Experience has demonstrated that including environmental and SD aspects in formal higher education is possible, though this requires considerable effort and produces slow results. Institutional commitment is fundamental, but insufficient unless successful in making use of the scarce opportunities available, such as the periodical curriculum reviews. Although slow and progressive advances are positive, general revision is needed if new engineers with the ability to lead the transition to SD are to be educated.

Furthermore, experience has demonstrated that, generally speaking, staff are interested in and agree with the objectives of introducing SD in the curricula, but do not know "how to do it". For this reason, many materials, documents and training courses have been developed at UPC, though their use is still low. New forms and incentives to promote the use of these tools are needed.

Another thing that has been learnt is that it is rather complex to measure quantitatively advances in curriculum greening. Indicators, surveys and other tools are needed to monitor the process, both in the short and the medium-long term.

Finally, a positive aspect is that the Environment Plan has "survived" several changes in UPC governing bodies, which means that it has now become a consolidated project at our university, and one that is easy to incorporate into the programme regardless of political colour.

References

1. I. Capdevila, et al., Journal of Cleaner Production, 2002, 10(1), 25-32
2. UPC, Environment Plan, 1996
3. UPC, Environment Report, 1997, 1998, 1999, 2000.
4. UPC, Environmental criteria in the design, construction and use of buildings and their planned application in Parc Tecnològic de la Mediterrania, EU, 2000.

Return to Contents

12. Barriers on the Path to Sustainability: European and Canadian Perspectives in Higher Education

Walter Leal Filho & Tarah Sharon Alexandra Wright

TUHH/TU-TECH, Germany & University of Alberta, Canada

Please send all correspondence to:
Prof. Walter Leal Filho
TUHH - TuTech
Schellerdamm 4
D-21079 Hamburg
Germany

Keywords: Higher Education, Sustainability, Challenges, Barriers, Future trends

Abstract

In higher education the term sustainability is often used to describe a positive movement to becoming more socially and environmentally responsible. The road to sustainability is not even. To pursue the path in a meaningful way, there are various elements that need to be considered and a number of matters to be taken care of, from proper planning, to appropriate methods for monitoring progress and measuring success. While maintaining the status quo is usually quite simple for universities, becoming more socially and environmentally responsible is not easy given the current framework and mandate of the modern university. In this paper we explore the challenges and barriers universities face when navigating the path to sustainability and offer example cases from European and Canadian perspectives. It is our hope that this approach will be useful for readers in order to better understand and identify the challenges and issues universities currently encounter in pursuing sustainability.

Introduction

The term sustainability infiltrates our society through government documents, mainstream media, corporate newsletters, and international agreements. The word itself has many meanings, and many critics. In higher education, the term has been used to promote the continuance of the current political, economic and bureaucratic systems. It has also been used, however, to describe a positive movement to becoming more socially and environmentally responsible institutions. It is this later spirit of the term that we would like to discuss.

Universities and other institutions of higher education need to practice what they teach. This goes from concepts of ethics and social behaviour, up to notions of gender and equity. Among the issues universities need to pay attention to, the subject matter of sustainability deserves a special emphasis. This is because sustainability not only encompasses the above matters of ethics and social behaviour in a holistic way, but also because sustainability entails good management and catalyses good academic practice.

The road to sustainability is not even. To pursue the path to sustainability in a meaningful way, there are various elements that need to be considered and a number of matters to be taken care of, from proper planning, to appropriate methods for monitoring progress and measuring success. While maintaining the status quo is usually quite simple for universities, becoming more socially and environmentally responsible is not easy given the current framework and mandate of the modern university.

In this paper we explore the challenges and barriers universities face when navigating the path to sustainability. The purpose of pursuing this question is to gain a better understanding of the issues encountered when implementing sustainability initiatives within a higher education context. This study is informed by Clugston (1999) who indicates that one of the major priorities in current sustainability research is to conduct in-depth research and evaluation of environmental initiatives in environmental education and sustainability, and to analyze specific case studies for critical conditions that determine the success or failure of initiatives. We feel that it is equally important to examine the barriers to the implementation of sustainability initiatives. The paper is also influenced by Leal Filho (2000) who indicates that researchers must got beyond theoretical discussions of sustainability and make more attempts to understand specific issues and themes (p.17). However helpful theoretical discussions and considerations on the goals of sustainability and associated paradigms are, more often than not they do remain theoretical and –as such- they are not the ones likely to lead to substantial changes in attitudes or improve things on the ground. In context, research must provide a basis upon which it may be substantiated by action

In this paper, we review literature related to the challenges to travelling the path to sustainability in higher education and offer example cases of barriers from European and Canadian perspectives. It is our hope that this approach will be useful for readers in order to better understand and identify the challenges and issues universities currently encounter in pursuing sustainability.

Travelling the Path to Sustainability

Becoming an environmentally responsible university involves change. This can be a confusing matter, as the term change is ubiquitous, but somewhat vague. Myers (1990) conceptualizes change as both an altered state and a process. Additionally, Myers claims that there are many forms of change including evolutionary,

revolutionary, cyclical, retrogressive or catastrophic, which can make a single definition difficult. Definitions of change are further confused by similar terms used in educational research such as paradigm shift (Ferguson, 1980), educational renaissance (Cetron, 1991), and educational reform (Fullan, 1991). For this paper, we have operationally defined change in the context of sustainability in higher education. In this light, change can be described in a positive sense as institutional reform with the purposes of making the system better and improving the environmental performance of the university.

While universities are often viewed as stagnant bureaucratic institutions, many universities have been able to at least start along the path of sustainability. From a Canadian perspective, there are numerous examples of universities that have become more environmentally responsible institutions and have attempted to affect positive environmental change in their communities and regions. The University of British Columbia, for example, developed an environmental policy and a sustainability policy and created a Campus Sustainability Office (CSO) in 1998 to oversee the implementation of the policies and to promote the tenets of sustainability. The CSO has been successful in its efforts, and claim that their initiatives are already "bearing fruit". For example, while the population of the University campus has increased, energy use throughout campus has decreased as a result of educational programs and equipment retrofits. The CSO still faces challenges such as decreasing paper use within the university which has proven to be a difficult goal to reach.

Mount Allison University is another example of a Canadian University attempting to become more sustainable. Many of the sustainability efforts within this institution have been initiated by students. The student Blue-Green Society, for example, provided the impetus and much of the work to complete the University Environmental Audit.

Efforts towards sustainability in higher education have not all been the work of individual universities. In Canada there are many regional and national organizations that support sustainability initiatives in post-secondary institutions. The Sierra Youth Coalition, a youth-run branch of the Sierra Club of Canada, has initiated the Sustainable Campuses Project that aims to network university students from across the country in their campus environmental efforts. Educational organizations such as the Association of Universities and Colleges of Canada has also made attempts to promote campus sustainability efforts through a few publications, although has no formal program or advisory board dedicated to sustainability has been formed to date. Various government departments have been pivotal in encouraging sustainability in Canadian universities, including a University President's Workshop titled "Learning and Sustainability" and a publication titled "Green Guide: A User's Guide to Sustainable Development in Canadian Colleges" (1992) by the National Round Table on Environment and Economy and Environment Canada which conducted a National Consultation on Environmental Education and Sustainability in 2000/01, and a subsequent National Strategy on Environmental Education and Sustainability which includes recommendations for colleges and universities.

Efforts towards environmental change and sustainability in European universities are a little more difficult to discuss due to different government and institutional structures. The following is a brief overview of what some European countries and universities have accomplished to date.

In the Netherlands there are various initiatives in the field of sustainability occurring, from networking (organized by VSNU, the Association of Dutch Universities) to a sustainable development platform whose members are universities. Finland, the world's most sustainable country according to the 2001 World Sustainability Index, has substantial funds invested on regional projects where sustainable development considerations are integrated in planning, and sustainable development issues are found in teaching and research programs in the majority of universities. While Germany was slow at the beginning, the debate on sustainability has evolved noticeably over the past four years. Initially limited to the area of environmental protection and to matters related to energy saving and emissions, universities now are actively pursuing the goal of sustainable development. In Hamburg, for example, TuTech runs a major programme on environmental information systems for sustainable development–over 3 years and a budget in excess of US$ 1 million- and universities can apply for money from a "sustainability fund" for projects that involve sustainability and higher education.

Many European universities are encouraged by governments to pursue issues related to sustainability. In Denmark, for example, the Ministry of Education and the Ministry of Environment act jointly in the development of sustainability programs in universities, but the focus is on technical aspects of sustainability, as opposed to philosophical ones. In this context, Denmark Technical University in Lundby is especially active. Another example is Belgium, where different efforts are seen in the French and Flemish speaking areas of the country. The Belgian Ministry of Education supports initiatives at universities and noticeable efforts are seen at the Free University of Brussels and the Catholic University of Leuvan (UCL). The Swedish government's decision to certify all public institutions (including universities) by 2004, has led to a wave of activities in respect to "greening universities" with positive outcomes. The first European university to be certified under the EMAS (Eco-Auditing and Management Scheme) was the Mid-Sweden University, but many others have followed since.

The above outline of action taking place in different institutions in Canada and Europe show that a lot has been done in advancing the cause of sustainability in higher education. However, there are many cases in which little action is seen. In France, for example, discussions on sustainability are punctual and limited to a few universities. The popular "Centres of Initiation to the Environment", which are widespread over the country, try to bring sustainability-related messages to the general public and seem to do more work in the area of sustainability than the universities. Wright (in-press) also identifies Canadian universities that have formally declared a commitment to becoming more sustainable, yet have made no progress in achieving this goal. While challenges may be different for each university, there are some common barriers to success that we will outline in the next section.

Roadblocks Along the Path to Sustainability

At this point we offer a caveat to the readers. In this section, we outline the various challenges to creating environmental change within higher education. An understanding of these challenges has emerged from the literature, our own experiences, and multiple discussions with colleagues. When we began writing this paper, it was our aim to offer examples of universities in both Canada and Europe that experienced these challenges. Finding individual institutions that were willing to be highlighted in the paper, however, proved to be a very difficult process. The literature on sustainability in higher education offered few examples of challenges and barriers to change as most universities reported on "best cases" and were subject to the objectivity of the author. When speaking with individuals within universities that had experienced challenges in pursuing sustainability, we found that most did not want to "air their dirty laundry" or report on the personal battles of the process because of politics within their institution. While we know that there is a long list of universities who have encountered both internal and external challenges in becoming more environmentally responsible and sustainable, we are currently only able to report on the challenges and barriers universities face along the path of sustainability in a more general sense.

Themes regarding the challenges and barriers to sustainable and environmental change within universities in the literature include governance issues (Allen, 1999; Keniry, 1995; Leal Filho, 2000; Smith, 1993), issues of advocacy and leadership (Allen, 1999; Cortese, 1992 Orr, 1990; Keniry, 1995; Wood, 1990), communication issues (Gilbert, 1996; Leal Filho, 2000; Smith, 1993), economic challenges (Keniry, 1995; Leal Filho 2000; MacTaggart, 1996; Smith, 1993), and policy issues (Wright in-press). An overview of the main problems, which is substantiated from examples documented in "Sustainability and University Life" (Leal Filho, 1999) is seen in Figure 1.

Governance Issues. There are many issues related to policy and governance within a university which present challenges for institutions to travel along the path of sustainability. From a Canadian perspective, universities are influenced by external forces. All Canadian universities derive their powers from provincial legislation and are considered to be legal private corporations (Hardy, 1996). While Canadian universities are considered autonomous institutions critics question this notion (Hethrington 1965; Hardy 1996; Jones 1996). According to Hetherington (1965), the complete autonomy of a university would require the institution to be completely financially independent. In Canada, however, universities rely on operating grants from their provincial or territorial government in order to finance the activities of the institution. In fact, provincial operating grants are the largest source of revenue in the budgets of almost all Canadian universities (Jones 1997). Hardy (1996) adds that all programs within Canadian universities must be approved at the provincial government level for funding to be awarded, which furthers the argument that these institutions may not be as autonomous as they claim to be. Such external influences can have a profound effect on the way an institution approaches sustainability issues.

- Poor awareness
- No endorsement
- Limited funds
- Few available materials
- Undocumented (good) experiences
- Lack of training
- Results achieved in the long-term
- Limited interest
- Limited support
- Limited usefulness
- Lack of communication
- Few active actors

Figure 1 - Some of the barriers to sustainability

On an institutional level, almost all Canadian universities have developed a bicameral governance structure. A Board of Governors represents government and other interests (commonly alumni and students) and is charged with the operation of the university including administrative and financial matters. A senior academic decision-making body (often called the Senate or the General Faculties Council) is responsible for all academic matters including student discipline academic appeals, faculty appointments, tenure, promotion and approving programs of

study presented by faculties. The President of the University is considered the Chief Executive Officer and is responsible to the Board of Governors and the Senate for supervision of both the academic and administrative work of the university. This system of governance often makes it difficult for policies regarding sustainability to be adopted as the academic governance bodies often have completely different agendas than the operations bodies who are often concerned with the bottom line of finances.

In Europe, most countries have a centralized funding system in the context of which the budgets for universities are administered by the Ministry of Education. Budget allocations are made once each year, or in some cases every two or three years. The basic funding covers running costs and personnel, but university personnel are

increasingly being pressured to pursue other funding venues to support non-basic activities. This state of affairs is reflected in the emphasis given to sustainability initiatives within the university. The problem that often exists is that not all university administrators regard sustainability initiatives as part of the role of the university. Limited funding, therefore, is often used to support conventional activities.

In an attempt to measure the degree of pressure universities face in terms of governance and sustainability issues, an on-going study on the state of the artof sustainability in the Baltic sea region in the context of the project BUSS (Baltic Universities Sustainability Survey) is being undertaken. The results so far obtained indicate the following:

a) national funding to sustainability-related work at universities is very limited;
b) most universities do not have access to such national funds, which means that only a few of them ever manage to gather support for initiatives such as curriculum greening, research works, etc;
c) most university personnel are not fully aware of possible (national and international) funding sources; and
d) complicated procedures in the application process and uncertainty on the outcomes inhibit many applicants from trying to obtain external funding.

An underlying feature of the BUSS study is that funding to sustainability work is being reduced to such an extent, that higher education institutions have to rely more and more on funds provided by the European Union (EU). Yet, most institutions do not feel able to meet the complicated procedures in application which would allow them to draw from the EU funds.

An exception to this reality is seen in the Netherlands, where a government-funded Platform for Sustainable Development provides cash and in-kind support for sustainability-related work in the country's higher education system. A further exception is seen in the City-State of Hamburg, where the Ministry of Science established a "sustainability fund" in 1998 to which Hamburg´s seven universities may apply to for funding. The results shown by both programmes indicate that, whenever available, financial support is usually translated into good work.

Advocacy and Leadership. According to Allen (1999), advocacy supplies the impetus for change within an institution. Advocacy is generally a grassroots activity, although one should not exclude the notion of top-down initiatives from administrators. In fact, advocacy is often most effective when the top down and bottom-up initiatives converge in the middle. Cortese (1992) states that advocacy usually results from a concerned individual or small group, rather than a large contingent who is concerned with a particular issue. Advocates can include parents, alumni, donors, students, faculty, staff and administrators. Additionally, Allen (1999) posits that institutional environmental change is often promoted by an individual or a group of individuals who are not associated with the governing structures of the university, but rather somewhere on the peripheries. A lack of advocates and advocacy can present a significant barrier to sustainability.

Leadership is also pivotal to sustainability and institutional environmental change (Orr, 1990; Keniry, 1994; Smith 1993; Rainsford, 1990, Riggs, 1997; Wood, 1990), as well as a common barrier (Allen 1999; MacTaggart, 1996; Perrin, 1992). Leadership can involve one charismatic leader, or a team of leaders in the form of a

guiding committee. The leader(s) must have power within the institution or access to power in order for change to occur (Lane 1990). The endorsement of key administrators within the university is therefore critical to the sustainability effort (Allen 1999; Clugston, 1999; Gittell, 1981, Keniry, 1995). Keniry (1995) claims that executive staff play crucial roles in stewardship initiatives, forging of partnerships, and making personal commitments to sustainability.

Communication Issues. Ali Khan (1995) considers communication a critical factor in promoting sustainability within the university community and discusses current challenges including:

- Awareness: there is a current need for a broader understanding of sustainability among university staff, especially at the senior (management) level;
- Consensus - there is a need for a broader consensus amongst university staff and students as a whole, but also among public, government and business in particular, especially in relation to the need to move with some urgency towards more sustainable lifestyles if future generations are to enjoy quality of life;
- Understanding - all people are directly affected by sustainable development issues but while awareness of these issues is considered to be high in some sectors, it is not so in others. Indeed, generally speaking, the level of understanding of these issues and of their significance and relevance is relatively poor, even in industrialized nations;

Additionally, in a discussion of the misconceptions associated with the concept of sustainability, Leal Filho (2000) describes items that could potentially pose an obstacle to pursuing sustainability. One theme that emerges is the concern amongst many individuals within higher education that sustainability has no scientific basis. This misconception is an enormous barrier to sustainability in higher education. While Leal Filho disputes this notion and gives evidence to the contrary, this lack of communication regarding the definition of the term sustainability is a significant barrier in higher education.

Economic challenges. Economic barriers are key in affecting sustainable change within individual universities. Allen (1999) argues that for change to be successful, a continual supply of monetary and staff resources must be guaranteed. Cerych & Sabatier (1986) state that personnel are perhaps the key component to effective institutional change, as they have the ability to organize and "fix things". Allen (1999) further purports that adequate space for work is an important factor in affecting change.

> Space resources are related to human resources: the change movement must have a place from which to operate on campus, and cannot end up in a basement: it should be in the main administration hall (Allen, 1999).

Financial resources within most universities, however, are often scarce. The challenge for individuals conducting work in sustainability and higher education is to find money in a current climate of fiscal restraint. This is further hindered by what Orr (1995) calls the "business of education". The current trend in many Western universities is towards a business model of higher education where students are viewed as clients and where competition is encouraged. In such an atmosphere, short-term thinking seems to supercede long-term visions.

Finding monetary support for sustainability initiatives, which might undermine university profits in the short term, but significantly effect the environment in the long term, can be daunting

Policy. The literature on university sustainability suggests a need for institutional policies regarding institutional environmental change to be developed (Keniry, 1995; Smith, 1993). Kraft (2001) indicates that policies often are good statements of the intentions of a university. However, Wright (in -press) states that while policies are a start in the right direction, they are not truly effective until there are implementation and accountability processes built in to such policies. Policies can be used as public relations documents and never be substantial or realistic enough to solve environmental problems on campus. Therefore, while policies may be an asset on the path to sustainability, many can also present additional challenges.

Proceeding with Caution and Finding New Routes

This paper has discussed the many challenges and barriers a university may face and the structural problems they have in pursuing the path towards sustainability. It has found that issues of governance, advocacy, leadership, communication, economics and policy can have a significant impact on a university's ability to affect change. In order for universities to travel further down the path, however, it is of fundamental importance that researchers and practitioners begin to seek solutions to the challenges and barriers that they face. While a full discussion of such solutions is beyond the scope of this paper, we offer a few suggestions, noting that more work in this area must be pursued.

On a societal level, good environmental governance is an essential component to sustainability in higher education as it has the ability to affect the individual efforts of universities to become more sustainable. Environmental governance refers to the laws, policies and institutions through which a society manages its environment. It is an important component of sustainability, and can only be achieved through compliance with laws and regulations governing the protection of the environment. Good governance will only be successful if citizens are provided with the necessary information relevant to environmental activities in their country, so that they are in a position to make intelligent claims and decisions about environmental issues, hence influencing the decision making for the benefit of both the country and the nation. Good governance, which may apply to a whole country on a macro context but also to individual institutions on a micro level, is therefore an important tool for sustainable development, being closely linked to environmental education and information.

On an institutional level, we believe that more funding must be made available to encourage universities to engage in environmental and sustainability research and practice. In Canada, major national funding agencies such as the Social Sciences and Humanities Research Council of Canada and the Natural Science and Engineering Council of Canada should be encouraged to make specific funds available for university sustainability research.

In Europe, EU funding provided within the context of the 5th and 6th Framework Programs should be matched by national funds, so that a sense of balance is reached. Also, the North-South divide whereby northern European countries invest more time and resource on sustainability projects than their southern counterparts is a problem that needs to be addressed.

Additionally, universities and governments should have incentive and recognition programs in place to encourage work that makes a university more sustainable.

A potential solution to overcoming past problems with policies is to develop policies with open consultation in the university community. Policies must be accompanied by implementation p lans and clearly state which individual(s) within the university community will be accountable for the implementation of the policy. Further, policies need the full endorsement of leaders and administrators within the university, which will complement the ground work done by the teaching and administration staff.

To nourish sustainability initiatives within the university, it is important to encourage individuals to have a better understanding of the importance of sustainability in higher education. Within the university this could involve the distribution of materials, information sessions and public panel discussions. On a national level, this could include the creation of a institutions such as a "National Task Force for Sustainability in Higher Education" and the organisation of annual meetings of university Rectors and Presidents with the specific goal of sharing information and encouraging university cooperation. This has happened on an ad hoc basis in the past, but needs to occur more systematically in the future.

The path to sustainability will never be an easy road to travel. It is hoped that this paper provides a stepping stone along the path, and that it may help individuals in higher education to gain a better understanding of the ramifications a university may face when pursuing sustainability, and perhaps inspire other individuals to pursue and continue work in finding solutions to these challenges in the future.

References

Ali Khan (1995) The Environmental Agenda. Pluto Press, London

Allen, A. (1999). Institutional Environmental Change at Tulane University. Unpublished honours dissertation, Tulane University.

Cerych, L., & Sabatier, a. P. (1986). Great Expectations and Mixed Performance: The Implementation of Higher Education Reforms in Europe. Trentham, Stoke-on-Trent, United Kingdom: Trentham Books Ltd.

Cetron, M. &. G. M. (1991). Educational Renaissance: Our Schools At The Turn Of The Twenty-First Century. New York: St. Martin's Press.

Clugston, R. (1999). Introduction. W. Leal Filho (ed.), Sustainability and University Life: Environmental Education, Communication and Sustainability (pp. 9-11). Berlin: Peter Lang.

Cortese, A. (1992). Education For An Environmentally Sustainable Future. Environmental Science and Technology, 26(6), 1108-1114.

Ferguson, M. (1980). The Aquarian Conspiracy: Personal and Social Transformation In Our Time. Los Angeles: J.P. Tarcher.

Fullan, M. &. S. S. (1991). The New Meaning Of Education Change. Toronto: OISE Press.

Gilbert, S. (1996). Making the Most of a Slow Revolution. Change, 19-32.

Gittel, M. (1981). Editor's Introduction. Education and Urban Society, 13(4), 389-398.

Hardy, C. (1996). The Politics of Collegiality. Montreal: McGill-Queen's University Press.

Hetherington, H. (1965). University Autonomy: Its Meaning Today. Paris: International Association of Universities.

Jones, G. (1997). Higher Education In Canada: Different Systems, Different

Perspectives. New York: Garland Publishing Inc.

Jones, G. A. (1996). Governments, Governance, and Canadian Universities. J. C. Smart (editor), Higher Education: Handbook of Theory and Research (Vol. XI pp. 337-371). New York: Agathon Press.

Keniry, J. (1995). Ecodemia. Washington D,C.: National Wildlife Federation.

Kraft, M. (2001). Environmental Policy and Politics. New York: Longman.

Lane, J.-E. (1990). Institutional Reform: A Public Policy Perspective. Brookfield, Vermont: Dartmouth Company Limited.

Leal Filho, W. (1999) (editor). Sustainability and University Life. Berlin: Peter Lang.

Leal Filho, W. (2000). Communicating Sustainability: Some International Considerations and Challenges. W. Leal Filho (editor), Communicating Sustainability (Vol. 8pp. 11-25). Berlin: Peter Lang.

MacTaggart, T. J. (1996). Restructuring Higher Education: What Works And What Doesn't In Reorganizing Governing Systems. San Francisco: Jossey-Bass.

Myers, N. (1990). Future Worlds: Challenge and Opportunity In An Age of Change. New York: Anchor Books.

National Round Table on Environment and Economy and Environment Canada. (1992). Green Guide: A User's Guide to Sustainable Development in Canadian Colleges. Ottawa, Canada: Environment Canada.

Orr, D. (1990). The Liberal Arts, The Campus, And The Biosphere. Harvard Educational Review, 60(2), 49-53.

Orr, D. (1995). What Is Education For? D. Orr Earth In Mind (pp. 7-15). Washington: Island Press.

Perrin, N. (1992). Colleges Are Doing Pitifully Little to Protect the Environment. Chronicle Of Higher Education, vol. 39, number 10, 3-4.

Rainsford, G. (1990). The Demographic Imperative: Changing to Serve America's Expanding Minority Population. D. Steeples (ed.), Managing Change In Higher Education (Vol. New Directions for Higher Education, 71). San Fancisco: Jossey-Bass.

Riggs, H. (1997). Industrial Strength Academies. J. W. Meyerson, & W. F. Massy (eds), New Models for Higher Education (pp. 53-96). New Jersey: Peterson's Princeton.

Smith, A. (1993). Campus Ecology: A Guide To Assessing Environmental Quality and Creating Strategies For Change . Los Angeles: Living Planet Press.

Wood, R. (1990). Changing The Education Program. D. Steeples (ed.), Managing Change In Higher Education (Vol. New Directions For Higher Education 71). San Francisco: Jossey-Bass .

Wright, T. (in-press). A Review of Definitions and Frameworks for Sustainability in Higher Education. Higher Education Policy / International Journal for Sustainability in Higher Education Joint Publication.

. McTaggart, Terrence J.
> 2. Perrin, Noel, 1992. "Colleges Are Doing Pitifully Little to Protect the
> Environment." The Chronicle of Higher Education, Vol. 39, No. 10, October 28,
> 3. Last reference changed to: Wright, T.S.A. (in press) Definitions and
> Frameworks for Environmental Sustianbility in Higher Education". You are
> correct, this is in the joint issue of IJSHE and HEP.

Return to Contents

13. Campus Verde: Greening the Campus of the new University of Lisbon at Caparica

Rita Fouto, João Joanaz de Melo and Cristina Pegado

New University of Lisbon, Portugal

jjm@fct.unl.pt, arff@fct.unl.pt, cp@fct.unl.pt
Department of Environmental Science and Engineering, New University of Lisbon, 2829-516 Caparica, Portugal

Abstract
This paper describes the first environmental survey of Caparica Campus (Portugal), carried out by the Campus Verde project in the year 2000. Environmental performance was evaluated using traditional methodologies and the EcoBlock method, recently developed in the University.
EcoBlock indicators provided a life cycle evaluation, considering building construction and demolitions and Campus operation for the year 2000. In result, waste production and global warming potential were identified as the main environmental pressures.
Campus Verde evaluation criteria included legal and normative compliance, certification and best practices requirements. The survey stressed out as priority areas: energy, urban and hazard waste and safety and risk management.
Both Campus Verde and EcoBlock evaluations pointed out energy (associated with global warming potential) and waste as major environmental problems on Campus.

Introduction

The Caparica Campus of the New University of Lisbon (UNL), Portugal, is located on the southern bank of the Tagus estuary, municipality of Almada, 10 km south of Lisbon. [Take in Plate 1]

It has approximately 30 hectares in use, including the UNL School of Science and Technology (FCT), facilities such as canteen, sports fields and student residence, and the Madan Park, a science and technology park that houses some 30 research institutions and high tech business. The Campus has a total population of about 6700, of which, 500 faculty, 300 university staff and employees, 300 graduate and 5300 undergraduate students, in 15 science and engineering departments; plus some 200 people in the Madan Park.

The Caparica Campus was commissioned in 1982, with the rationale that it should be near but outside the city, in a setting with good environmental quality, not overly urbanized, and with expansion capacity to eventually accommodate the entire UNL. Although the model was never fully carried out as other schools of UNL settled in Lisbon, but the Campus concept remained. An urbanization plan for the Campus was created in 1990.

[Take in Plate 2]

The Campus Verde project

Concept and goals

The Caparica Campus has the population of a small town and the corresponding complement of management difficulties, including a number of significant environmental problems — and opportunities.

Since Caparica possesses a department and programs on Environmental Engineering, it was only normal that initiatives would emerge to remedy in-house environmental troubles.

One such initiative was the Campus Verde project. It began in 1998 as an idea of a couple of students and an assistantprofessor: to apply the methodology used in a practical course on Environmental Management and Auditing to the Campus itself. By 2000, the project was sponsored by the University and developed into a full-scale demonstration project. Today, it has become the framework for the creation of the Caparica Campus environmental management system (EMS).

The main goals of the 2000/1 stage of the Campus Verde project were:

1. To conduct an environmental survey of the whole Campus, quantifying environmental effects and identifying critical environmental aspects;
2. To assess the Campus environmental performance using the EcoBlock method;
3. To establish guidelines for the implementation of an EMS in Caparica Campus, in order to foster both better management practice and better environmental performance;
4. To encourage the University to work toward environmental certification (ISO 14001 and/or EMAS).

Implementation steps

The project was developed in six steps:

1. Define evaluation criteria
2. Gather information
3. Identify relevant aspects and impacts
4. Organize information
5. Measure environmental performance
6. Analyse results and decide upon actions

Table II summarizes the main aspects and results in each step.

[Take in Table II]

Performance indicators

To assess the performance of environmental related activities on campus, two sets of indicators were defined:

- Operational indicators, related to actual effects on the environment, usually representing environmental pressure;
- Management indicators, related to internal efficiency.

Table III summarizes the adopted indicators.

[Take in Table III]

Scope and organization of information

The information was organized in three ways in order to produce:

a) A global assessment report, organized by environmental domains: land use, water, energy, transportation, air emissions, waste, safety, current and contract procurement;

b) Specific assessment reports of the University buildings, in order to help define priorities at the structural level (remodelling, maintenance, equipment, measurement, treatment, etc);
c) Specific assessment reports of the School organizational units, so that each department, research unit and internal, outsourcing or concession service might take immediate action.

Deliverables

The results were organized by the following deliverables:

1. List of high priority measures, containing all the corrective measures identified as urgent, related with highly negative impacts that were registered (especially legal and normative irregularities), and to be submitted to the School board with a strong recommendation of urgent implementation.

2. Environmental survey report (year 2000), assembling all the information collected and produced on campus, building and organisational unit levels, namely:

- The operational and management environmental data;
- The results of their comparison with the established references;
- The high priority corrective measures;
- The recommendations for further action.

3. Guidelines for EMS implementation, to respond to the final goal of campus environmental certification of the campus, and thus reflect the EMS cycle:

- Top management commitment (environmental policy);
- EMS structure planning (agents, responsibilities, actions and documents);
- EMS implementation;
- EMS evaluation and review.

The EcoBlock method

The EcoBlock project is being conducted on campus at the UNL - Department of Environmental Science and Engineering and the *Centro Excelência para o Ambiente* (CEA), a research facility in the Madan Park. Its main goal is to develop a set of operational environmental performance indicators that can be used to assess both organizations (companies or institutions) and products (goods or services). This compatibility allows an expedient comparison between products, companies or raw material sources; an easy connection between EMS, eco-design, eco-labeling and benchmarking; criteria for the control of environmental performance of suppliers; and the transport of environmental information throughout the supply -demand chain, simplifying life cycle analysis.

Environmental performance is here defined as the actual influence on the environment, as opposed to management performance. Under the concept of environmental performance, there are two complementary approaches: environmental impact and environmental pressure. Environmental impact is the best measure of environmental performance, but it requires a very large amount of information, and is highly dependent on local conditions and complex cumulative effects. It is appropriate to assess a large enterprise for strategic decision-making, but it is not practical to assess a product, or current operations of a company. Environmental pressure indicators are better to evaluate environmental performance because, although they integrate less local information, they are much easier to measure and compare. Environmental pressure is defined as any activity with influence on the environment (natural resource consumption or environmental degradation).

The EcoBlock set of pressure indicators quantify natural resource consumption and environmental degradation potential in a comparable way, though not considering specific environmental impacts. The selected indicators are: water consumption, materials consumption, global warming potential emissions, polluting emissions (gaseous emissions, wastewater and solid waste) and land use. Note that these indicators can be obtained from typical EMS records, such as water and energy use, waste sampling, raw materials listings, plant maps and historical records.
Each indicator results from an aggregation of data based on potential harmfulness as implied by existing legislation or norms. They bear a direct correlation with global impacts, such as global warming or background pollution, or with regional impacts, such as water and land use. They can be added to compute the total environment pressure exerted by a company or product.
EcoBlock indicators are given in Table IV.
[Take in Table IV]
The EcoBlock method is now being tested extensively in Portugal, with a number of case studies, namely in the construction and real estate and from raw material extraction to the final product put on the market by the developer. It has already been applied to a number of companies and institutions, including the UNL Campus at Caparica.
Results
The main results of the Caparica Campus first environmental survey are expressed as performance indicator results (Table V).
[Take in Table V]
Results of the application of the EcoBlock methodology are shown in table VI.
[Take in Table VI]
Discussion
Campus verde suvey
The following aspects and priorities of action were identified in the 2000 survey:
Energy: The energy consumption of the FCT is above the legal admitted value, and so the School must conduct an energy audit of its operational facilities, and define and implement a five years plan to rationalize energy consumption.
Urban waste: The domestic waste trial rates (of glass, plastic, paper) are below the national recycling goals, and so it is important to define and implement a selective scheme at the workplace level, connected with the street selective containers.
Hazardous waste: Half of the identified hazardous waste types (according to the European Waste Catalogue) have an undesirable destination. The School must conduct a specific survey to list all the produced hazardous waste types, their source, characteristics and quantities, and define an adequate management scheme for each of them.
Safety and risk management: The lack of knowledge, training and adequate tools for risk prevention, and safety assurance in the School is a major problem. A specific audit is urgent, in order to correct and improve infra-structural aspects. However, more importantly, the organisation of safety, health and hygiene services is required, as prescribed in the national legislation. These services might also assemble environmental and quality managements, not yet established by the School as they should be, toward an integrated approach for quality, safety and environmental certification of the School.
Table VII summarizes the assessment measures and recommendations proposed, based on the information collected and the indicators used.

[Take in Table VII]

EcoBlock method

The indicators refer to the Campus environmental performance in the year 2000 and the building construction and demolition pressures considering an 80 years lifetime.
Pollution emissions related to laboratories sewage were not calculated due to the lack of data. Energy consumption was determined as a halfway step to calculate other environmental pressures such as: material consumption, green gas emissions, pollution emissions and other EcoBlock indicators.
Waste production and global warming potential were identified as the main environmental pressures.

Comparing results

EcoBlock provided a global performance evaluation through campus lifecycle; in consequence, waste production and global warming potential were identified as the main environmental pressures.
Campus Verde set up its evaluation criteria in legal, normative and certification requirements; in result, energy, urban and hazard waste, safety and risk management were pointed out as major priorities.
Both evaluations highlight energy (associated with global warming potential) and waste as major environmental problems of the Caparica campus. This may lead to the conclusion that minimum compliance requirements are set upon effective environmental pressure.

Follow-Up

Implemented actions

Following the 2001 Campus Verde reports, a number of actions have already been taken or decided upon:

Corrective Actions

- A domestic waste management system was approved and implemented;
- An energy audit of the Campus main departmental building was conducted;
- Several hazardous waste management proceedings are being developed.

Toward EMS

- The Campus charter of environmental principles was approved and signed;
- The environmental survey report was reviewed by the School board and is currently in press.

Scientific and Academic Contributions

- Four student groups focused their academic work on several aspects of the Campus Verde project results.

Future developments

- The School environmental policy and action plan are presently under discussion by the appropriate bodies of the University;
- A project to extend the Campus Verde experience to a network of environmentally pro-active University campuses in Portugal is under way. EcoBlock method will be used to compare each campus global environmental pressure.

Lessons Learned

In conclusion, several lessons were learned from this experience:

- The project represented an innovative approach within the context of the Portuguese universities environmental performance evaluation;

- By itself, the project increased awareness of environmental issues among the campus population;
- Some of the most pressing environmental problems have already been solved or at least tackled; these results are very important to demonstrate the usefulness of the approach and to foster further improvements;
- The University and the School boards have some difficulty balancing environmental priorities with other management priorities, and getting financial support for their implementation;
- EMS implementation and success depends on role play conscience (of students, teachers, researchers, managers, workers, visitors, etc);
- The lack of monitoring data implies estimation, and thus, less credible results: the implementation of an on-campus monitoring scheme is urgent.

Tables

Table I – Main data in Caparica Campus description

Data type		Value	Comments
Organic structure			
Entities present on Campus		3	SAS-UNL: University Social Services FCT-UNL: University School of Sciences and Technology Madan-Park: Park of Science and Technology association
Madan	Directive Boards	1	
	Research Institute	1	Gathering 14 research sections and centres
	Small Enterprises	13	All in sciences and technology fields
UNL	Social Boards	4	General assembly, senate, administrative council, directive board
	Organic Units	9	6 Schools and 3 institutes
FCT	Social Boards	6	General assembly, directive council, administrative council, scientific council, academic council, consulting council
	Departments	13	Environmental Sciences and Engineers Dep., Chemistry Dep., etc
	Research Centres	12	
	Centralized Services	12	Technical services, information and documentation services, informatics services, etc.
	Rented Services	13	Food services, bank, bookstore and stationary services, copy services, etc
Land use			
Total area Area in use		30 ha 14 ha	
Green area		7 ha	(10% treated)
Impermeabilizada area		4,2 ha	(streets, walkways and parking)
Constructed gross area		2,8 ha	(buildings)
Constructed net area		6,8 ha	(sum of all floors except wall area)
Temporary constructed area		0,15 ha	(4 buildings)
Population			
Total population		6700	FCT, SAS, Madan Park
FCT population		6300	FCT students, teachers and other employees

Table II – Campus Verde methodology

Step	Relevant aspects	Results
1. Define evaluation criteria	Criteria: - Legal compliance - Normative compliance - Distance to certification - Best practice approach	Database with: External references (e.g. legal and normative requirements) Internal references (e.g. procedures, data)
2. Gather information	Obtain a general view of the Campus	Visit guide and records
	Clarify action	Work plan and info list
	Assess management aspects	Interview guideline and audit visit checklists
	Assess operational aspects	Scripts and records
3. Identify relevant aspects and impacts	- Legal, normative, certification and case comparative aspects - Operational and management aspects - Negative and positive impacts	List of relevant aspects and impacts
4. Organize information	Environmental domains: • Water • Energy • Transportation • Air emissions and workplace environment • Solid waste and hazardous substances • Safety and risk management policies • Land use • Current procurement • Contract procurement	Environmental evaluation database organized by: Environmental domains; Scope levels: • Campus University Pole • University buildings • School organic units
5. Measure environmental performance	Evaluation methodologies: - EcoBlock method - Other methods	Evaluation indicators
6. Analyse indicators and decide actions	No compliance with legal and / or normative requirements	Corrective measures
	Distance to certification requirements	Recommendations and guidelines for EMS
	Distance to comparable best practices	Recommendations

Table III – Campus Verde performance indicators

Environmental domain	Operational (environmental) indicators	Management indicators
Water	Water consumption (m^3)	Water reuse (*%*) Water quality (*descriptive, relative to legal standards for domestic supply*)
	Wastewater production (m^3)	Wastewater quality and treatment (*descriptive, relative to legal standards for domestic sewage*)
Energy	Energy consumption (*GWh*)	Energy production (*GWh*) Energy savings (*descriptive*)
Transports		Travel time (*min*) Individual/ public use (*%*) Parking capacity in Campus (n^o)
Air Emissions	Greenhouse gas emissions (*kg CO_2 eq.*)	Green gas emissions reduction (*%*)
	Ozone layer depletive gas emissions (*Kg CFC11*)	Ozone layer depletive gas emissions reduction (*%*)
Waste	Urban waste production (*ton*) Hazardous waste production (*ton*)	Urban waste trial (*%*) Hazardous waste trial (*%*)
	Medical waste production (*ton*)	Medical waste trial (*ton*)
Safety	Safety related Accidents (n^o)	Risk survey results (*descriptive*) Safety and risk training (*hours*) Fire combat training (*hours*) Evacuation exercises (n^o/*building*)
Land Use	Green area (*ha*)	Maintained green area (%)
	Impermeable area (*ha*) Gross and net built area (*ha*) Land consumption (*ha*)	Urbanization planning and practice (*comparison*)
	Soil pollution (*kg herbicides; g/m^2 fertilizers*)	Soil pollution prevention (*descriptive*)
Current procurement		Materials, products, furniture and equipment acquisition practices (*descriptive*) Proposals selection criteria (*descriptive*)
Contracting procurement		Environmental aspects (+/-) Requirements for suppliers, outsourcing and commissioned services (*descriptive*)

Table IV – EcoBlock environmental performance indicators

Indicators	Criteria	Weighting factors	Equations
Water consumption ***(m^3 eq)***	Source Resource Availability	$f_{use\ intensity}$ - water consumed is weighted by the water availability	$f_{use\ intensity}$ = Water extracted per year / Water available per year Water consumption = Σ (Volume $_{source\ i}$. $f_{use\ intensity\ i}$)
Material consumption ***(ton eq)***	Material consumed Stock Renew ability	$f_{deplection}$ - based on the net material consumption and material Stock	$f_{deplection}$ = (Consumption per decade – Creation per decade) / Stock Material consumption = $\sum$ (mass $_i$. $f_{depletion\ i}$)
Land used ***(m^2 eq)***	Occupied Area Land use change Recovery time	f value – social and ecological value of the area	Area = $\sum$ Area . ($f_{initial\ value}$ - $f_{final\ value}$)
Pollution emissions ***(ton eq)***	Gas, liquid and solid emissions Toxicity	f_{DERT} – compare parameter with the solids hazardousness considering the limit values (LV) from TSS (liquid emissions) and PSM (gas emission) f_{DERT} based on final disposal and waste hazardousness	f_{DERT} = $LV_{TSS/PSM}$ / LV i (liquid and gas) f_{DERT} (waste) = 0 total recovery; = 1 treatment, landfill, = 1000 mix hazard waste Pollution = $\sum$ (f_{DERT} X mass i)
Global warm Potential ***(CO_2 eq)***	Greenhouse gas emission	According to IPCC methodology	Global warming potential = $\sum$ GWP i

Table V – Campus Verde indicators results

Indicators		Value	Unit (*per year*)
Resource Consump.	Area	6600	m
	Water	136000	m^3
	Energy	6,05	GWh
	Materials	23	ton office paper (80 gr/ m^2)
Pollution Emissions	Wastewater Production	116100	m^3
	Hazardous Substances in Wastewater	9800	l
	Greenhouse Gas Emissions	106	kton CO_2 eq
	Ozone Layer Depletive Gases Emissions	200	kg CFC11
	Municipal Waste Production	153	ton
	Hazardous Waste Production	10	Identified classes according to the European Waste Catalogue
	Medical Waste Production	205	kg
	Herbicides Use	10	l
	Fertilizers Use	3	g/ m^2
Management Investment	Training	0	Hours
	Visibility	1	Results demonstration
	Research	$5{,}6x10^6$	PTE investment
	Commitment	1	Document signed
	Responsibility	1	Formalized New Competence

Table VI – EcoBlock indicators results (equivalent factors)

Indicator	Construction /Demolition	Use	TOTAL
Water consumption *(dam^3 eq)*	0,009	136	**136**
Material consumption *(ton eq)*	27	897	**925**
Land use *(ha eq)*	0,01	0,93	**0,94**
Pollution emissions *(ton eq):*	4282	286	**4568**
Liquid emissions *(ton eq)*	0	109	**109**
Gas emissions *(ton eq)*	0	5	**5**
Waste (ton eq)	4282	171	**4453**
Global warming potential *(ton CO_2 eq)*	1	2943	**2944**

Table VII – Caparica Campus survey results

Environ. domains	Corrective measures and recommendations
•• **Water**	Water supply ▶ Control consumption rates, promote saving and reuse strategies ▶ Measure and control quality Wastewater ▶ Measure and control quality (analysis; sewage structure repairs) ▶ Improve quality (trial of liquid hazardous substances)
••• **Energy**	▶ Control consumption rates; guarantee production appliance and promote savings and rational use strategies ▶ Conduct energy audit and 5 years action plan
•• **Transports**	▶ Control car access to Campus (database and regular reports) ▶ Promote no car use (negotiate with public service provider; hitch-hike schemes) ▶ Improve external parking offer and implement cyclable scheme
•• **Gaseous emissions**	Air quality ▶ Measure, control and reduce gaseous emissions in the Campus ▶ Convert school vehicles to no pollute systems Indoor air quality ▶ Measure and control indoor air quality
••• **Waste**	▶ Implement a selective trial system at workplace level ▶ Survey and list hazardous waste production and define adequate management strategies
••• **Safety**	▶ Conduct safety audit and risk assessment, establish action plan ▶ Update the School safety manual in accordance with regulation ▶ Develop training program and exercises and organize the safety, health and hygiene services, as prescribed in the national legislation
• **Land use**	▶ Follow (or update) the urbanization plan and control the built/total area ratio ▶ Improve landscape integration and green area planning ▶ Eliminate soil pollution
•• **Current procurement**	▶ Survey and list main acquisitions and update database and improve management proceedings ▶ Introduce environmental criteria in procurement policies ▶ Maximize products life cycle
• **Contract procurement**	▶ Survey and list main services provided, review contracts ▶ Introduce environmental requirements in proposals elaboration and selection

Legend:

•• / • Urgent action (legal compliance criteria)


Recommended action (certification criteria)


Ideal action (best practices criteria)

Photos and Illustrations

Plate 1 – View of the Caparica Campus

Plate 2 – Map of the Caparica Campus (year 2000)

Acknowledgments
The Campus Verde and EcoBlock research projects would like to thank:

- Mariana Pereira, for her support in the paper review;
- Universidade Nova de Lisboa – Faculdade de Ciências e Tecnologia (*New University of Lisbon - School of Science and Technology*), for Campus verde financial support;
- SONAE Imobiliária SGPS, for EcoBlock financial support;
- Madan Park – Centro Excelência para o Ambiente (*Madan Park – Centre Excellence for the Environment*), for both projects institutional support.

Selected bibliography

[1] Calado, A. and Fouto, R. (1998). Levantamento Ambiental à Faculdade de Ciências e Tecnologia (FCT). Relatório final do projecto de fim de curso - disciplina de auditoria e ecogestão. Departamento de ciências e engenharia do ambiente da FCT. Monte de Caparica, Dezembro de 1998.

[2] Calado, A. and Fouto, R. (2000). Levantamento Ambiental ao Campus da Caparica, ano 2000. Relatório final. Projecto Campus Verde – CEA. Monte de Caparica, 2001.

[3] CES (1995). Blueprint for a Green Campus. The Campus Earth Summit Initiatives for Higher Education. A project of the Heinz Family Foundation. January 1995. (http://www.igc.apc.org/cgv/blueprnt/homepage.html)

[4] Martinho, G. and Sobral, P. (1998). Implementation of the Eco-Campus concept.

[5] CRE (1994). COPERNICUS Charter: the university charter for sustainable development. Conference of European Rectors (CRE). Geneva, May 1994. (http://iisd1.iisd.ca/educate/declarat/coper.htm)

[6] Pegado, C., Joanaz de Melo, J. e Barros, T.B., EcoBlock – Método de avaliação do desempenho ambiental, 2001, In: Actas do 6ª Congresso Nacional de Engenheiros do Ambiente. APEA, Lisboa, 8-9 Novembro 2001. (editado em CD);

[7] Pires, A.R. and Oliverira, J.A (1999). Políticas Ambientais em Universidades – o caso da Universidade de Aveiro (UA). Relatório final do projecto de fim de curso - disciplina de planeamento regional e urbano. Departamento de ambiente e ordenamento da UA. Aveiro, Dezembro de 1999.

[8] Smith, A. A. and SEAC (1993). Campus Ecology. A guide to accessing environmental quality and creating strategies for change. Living Planet Press, Los Angeles.

[9] The Earth Council (2000). Earth Charter. March 2000. (http://www.earthcharter.org/earthcharter/charter.htm)

[10] ULSF (1990). Tallories Declaration. ULSF International Conference in Talloires, France. (http://www.ulsf.org/pdf/TD.pdf)

[7] Wastebusters Ltd (1997). The Green Office Manual, a guide to responsible practice. Earthscan Publications Limited, London, 1997.

Useful Addresses

CRE-Copernicus
10, Conseil-Général | CH-1211 Genève 4 | Tel: +41 22 329 26 44 / 329 22 51 Fax: 329 28 21 | Telex: 428 380

Copernicus Network Coordination
Carl-Einar Stalvant | Centre for Natural Resources and Environment Research | Stockholm University | S-10691 Stockholm | Tel: +46 8 163 663 | Fax: 158 417

University Leaders for a Sustainable Future (ULSF)
"L" Street | NW, Washington, DC | 20037 USA | Tel: 202-778-6133 | Fax: 202-778-6138 | E-mail: info@ulsf.org | Site: http://www.ulsf.org

The Earth Charter Initiative
The Earth Council - International Secretariat | P.O. BOX 319-6100 | San Jose, Costa Rica | Tel: +506-205-1600 | Fax: +506-249-3500 | Email: info@earthcharter.org | Site: http://www.earthcharter.org

Authors Contact Details:
João Joanaz de Melo

Full Name: João Joanaz de Melo

Affiliation: Department of Environmental Sciences and Engineering, School of Sciences and Technology, New University of Lisbon

E-mail address: jjm@fct.unl.pt

Full International Contact Details:

Adress: Campus da Caparica, Edifício Departamental A, GASA-DCEA-FCT (Secretaria) | Quinta da Torre, 2829-516 Lisboa, Portugal | Tel / Fax: +351-212-948-374

Rita Fouto

Full Name: Ana Rita Ferreira Fouto

Affiliation: Centre Excellence for the Environment – Madan Park, Almada-Setúbal Science and Technology Park

E-mail address: arff@fct.unl.pt

Full Intern ational Contact Details:

Adress: Campus da Caparica, Edifício CEA, Secretaria CEA | Quinta da Torre, 2829-516 Lisboa, Portugal | Tel: +351.212.948.306 | Fax: +351-212-948-321

Cristina Pegado

Full Name: Cristina Júdice Coelho Pinto Pegado

Affiliation: Department of Environmental Sciences and Engineering, School of Sciences and Technology, New University of Lisbon

E-mail address: cp@fct.unl.pt

Full International Contact Details:

Adress: Campus da Caparica, Edifício Departamental A, GASA/DCEA/FCT (Secretaria) | Quinta da Torre, 2829-516 Lisboa, Portugal | Tel / Fax: +351-212-948-374

Return to Contents

14. Environment and tourism – academic responsibility

J L Hoeffel, A A B Fadini &C F S Suarez

Universidade São Francisco–USF, São Paulo, Brasil

João Luiz Höeffel is Brazilian with a degree in Biochemistry, a Master's degree on Food Science and a Ph.D. in Social Sciences with a focus on environmental problems and development. He teaches at São Francisco University, Bragança Paulista, São Paulo, Brasil where he also coordinates an Environmental Research on Water Conservation, Tourism and Environmental Education. For the past decade, Prof. Höeffel has been coordinating courses on environmental ethics and values on several education institutions.

Almerinda Antonia Barbosa Fadini is Brazilian with a degree in Geography, a Master's degree in Geoscience and environment and is attending a Doctorate Course in Geography. Prof. Fadini is a professor and researcher at São Francisco University, Bragança Paulista, São Paulo, Brasil, where she has been working on the tourism and environmental field.

Cristiane Ferraz e Silva Suarez is Brazilian with a degree in Tourism and is attending a Master Course in Tourism and Environmental Planning. Prof. Suarez teaches at São Francisco University, Bragança Paulista, São Paulo, Brasil, where she is also a member of the Tourism Course Commission. She has been working as a travel agent for many years.

Universidade São Francisco–USF
Tourism and Hotel Management Department
Rua Eunice Ferraz Fernandes 151
12914-500 Bragança Paulista
São Paulo, Brasil

Telephone/Fax – 55-11-40342344
e-mail–joaoluiz@saofrancisco.edu.br

Keywords: Sustainable tourism; Environmental education; Environmental research; Citizenship; Water resources

Abstract *The aim of the bachelors degree program in tourism at the University São Francisco is to involve students and the teaching staff in developing work related to sustainability, tourism and environment within a local, regional and global context. One of the mechanisms adopted has been the creation of disciplines and research activities that associate theory together with practice. One example of this is environmental field study that involves teachers from diverse areas, promoting both an inner and multi-disciplinary approach within research and among students, and the teaching staff. Such an approach has brought about discussion and reflection that has led to ways of thinking and acting that perceive the surrounding environment in a whole and unfragmented manner. This unfragmented perception in turn has led to a systemic vision underlying action. It has also allowed an overview of tourism sites, their potential and the planning needed to create sustainability by maintaining and promoting natural recourses and architectural and historical patrimony as well as empowering the local culture by including the population in decision making processes and social ascent. The awakening of a commitment that involves at the same time tourism – environment – society, reinforces the academic sectors responsibility toward the environment, transforms ideas, values and standpoints and stimulates the respect for people and the meaning of citizenship in society.*

Tourism and environmental sustainability

Over the past few years, there has been increasing worldwide concern with both the conservation and use of natural resources and the present situation of human cultures and societies. Diverse environmental problems have become the focus of attention, research, and the study of scientists, politicians, governmental and non-governmental institutions and even the general population.

This discussion has gradually led to the formulation of the concept of sustainability and its incorporation into the different sectors of society. Thus, the search for sustainable and environmentally suitable models has become a necessity although not yet a priority when formulating many public policies and is clearly reflected in the area of education.

Within this context, environmental education has become incorporated as a theme running through Brazilian educational policy and may be found throughout the various educational levels – kindergarten through higher education. Hence, different institutions of higher education have either adopted specific courses of study, which debate sustainability or are adjusting their curriculum in order to deal with this subject in a broader fashion.

In what regards undergraduate and graduate tourism courses, one needs to recognize tourism's direct relation to the environment in order to develop and plan activities which avoid, minimize and correct environmental disturbances.

Certain authors (Hall & Lew, 1998; Honey, 1999), critically observing the expansion of tourism have suggested that environmental education may incite a different awareness and attitude of the individual towards nature, which may be reflected in the individual's actions and behavior as both a tourist and citizen.

In this article, we will present and discuss actions which have been developed by the undergraduate course in tourism at São Francisco University – *campus* Bragança

Paulista – São Paulo– Brasil. This course aims to incorporate sustainable practices into touristic activities.

Community, citizenship, tourism and leisure: academic responsibility

Academic responsibility is pertinent in all areas of study and scientific undertaking and is especially important in those areas that involve society and environment. By assuming an ethical commitment to the learning-teaching process, the educator seeks to provide and promote knowledge building that leads to a re-evalution of values, changes in attitudes and encourages responsibility to create a new society.

Within this context tourism related activities that have in the past demonstrated a lack of commitment to nature and to the areas and communities where they have taken place will be analyzed.

Based on the argument that tourism adds value to the landscape, and brings new opportunities to the people involved, tourism promoted by the media has expanded worldwide.

Tourism is seen by many as *people moving in search of entertainment* and the way it is presented, leads people to believe that in order to be entertained it is necessary to travel. Krippendorf (1989) carried out a research project which posed the question: Why did you take a trip on your holidays? Most of the individuals answered – to rest, to relax, to escape from everyday life, to change the surroundings and to be in contact with nature, etc.

The tourism industry and the media tell us that in order to be able to rest, to escape from routine, to be close to nature, even if it is artificially built, one must travel. Many people indeed consider that the change of surroundings and routine, which traveling promotes, as essential for feeling pleasure in their free time.

It is a fact that in the contemporary world it is difficult to enjoy free time and to directly experience reality and it seems always necessary to fall back on regular trips and illusions, promoted by tourist attractions without any authenticity to meet this need.

There is a general view that work is a burden, and that life begins when office hours end. Hence, for Marutscha Moesch (2001), travel becomes an escape valve, serving to relieve pressure in the individual in face of his/her impotence to change the alienation caused by conditions in the working world.

There is no doubt as to the importance of visiting new places, meeting people, enriching oneself culturally and becoming familiar with different habits and lifestyles. However, it is necessary to rethink tourism which promotes positive changes in people's lives during holidays alone.

It is important to realize that the pleasure one can obtain from free time should not be derived from an economic view of play and ephemeral happiness, but through placing value on our everyday experiences of living amongst others, on a sense of place, on the fight for dignity in the workplace, on the cultural and leisure activities common in our daily lives and in attaining quality of life.

Amusement, entertainment and play, as emphasized by Cavallari and Zacharias (2000), can be obtained in any situation – either paid or free. Education therefore, becomes necessary in order to help the citizen learn how to use free time with the purpose of finding integration between the individual and his environment.

Tourism is understood as an option used during free time to obtain leisure, and both tourism and leisure are intrinsically linked. For Marcellino (2000), tourism can and should be understood as a cultural leisure activity, an opportunity for knowledge building and increasing sensitivity, social awareness and new experiences.

But who has the right to leisure? All those who have the opportunity to travel or to go on a tour or do all citizens have the right to leisure?

Leisure should be considered as an indicator of quality of life in a population although it is not always considered as such. However, the fight for the right to leisure must be followed by other social victories and by respect towards citizenship.

For Milton Santos (2000), it is through local actions and the strengthening of a sense of place, that one may acquire citizenship. It is from this sense of place that lies the possibility for increased awareness and a greater understanding of the world in which we live.

> *(...) the possibility for full citizenship amongst people depends on solutions sought locally, and this possibility can only exist when within the nation, a federation of places, a new political-territorial structure, and the indispensable redistribution of resources, privileges and obligations is established. Only when a country becomes a federation of places will it be possible to build a world as a federation of countries. It is a question, in both stages, of building from the bottom up and, in which the main point is the existence of strong individuals and their corresponding legal rights. The geographical base for this construction will be found where there exists a sense of place, and in which a fulfilled existence takes place* (Santos, 2000, p.112).

Through tourism the local space has been exalted. However, what we notice is that tourism has promoted an artificialization of these new spaces that affects the environment, people's way of life and causes a breakdown of the existent economy.

The space intended to be used by tourism demands an organized local community in order that the decisions regarding changes in the landscape go through the democratic organisms already existent. If these organisms do not exist, there must be a priority to build and strengthen them through instruments such as the organic municipal law, laws for occupation and land use, participative planning and respect for the existent municipal and national legislation.

Other questions to be considered when thinking about tourism impact is how careful one must be not to interfere with the features of the local culture. This can be attained through respect, education and integration between the traveler and the receiving nucleus.

For Marutscha Moesch (2001), tourism is a phenomenon with cultural, social, political and communication consequences which must be studied, mainly because it has become the right and desire of all citizens belonging to any social class or any society, be it developed or not.

According to Norma Moesch (2001), tourism does not necessarily compromise the environment and suggests that educational activities could provide a promising route towards strengthening the standards of sustainable tourism.

Based on the perspectives presented in this text, some tourism courses have incorporated in their content the concept of sustainability.

The undergraduate course in tourism at the University of São Francisco has developed work that involves university teachers and students in the concept of environmental tourism and its reflection within a local, regional and global context.

One of the strategies that has been adopted is the creation of courses that value the link between theory and practice and involve teachers from distinct areas, thus promoting inter and multidisciplinary studies and research. Another aspect is the encouragement of research activities that involve teachers, students and members of local and regional communities and have in mind the environmental sustainability of the region where the university is located.

The São Francisco University *campus* in Bragança Paulista is located in the northeast region of the state of São Paulo, known as the Bragantina region. In this regions are found watershed of national importance, remnants of Atlantic Forest and cultural singularities that go back to the colonization of Brazil. These components, either individually or as a group provide significant potential for tourism.

The research on the Bragantina region demonstrates the university's concern with its surroundings and awareness of the environmental complexity of this area.

Regional features as elements of reflection on sustainability

The search for sustainable and environmentally suitable models becomes a priority for areas which are susceptible to a rapid process of degradation as well as for areas with resources of significant ecological and economic importance such as watersheds for example.

In the state of São Paulo in 1987 this issue determined the creation of the Piracicaba and Juqueri-Mirim rivers environmental protected area (EPA Piracicaba). Its boundaries were determined upon the protection of this region watershed (Secretaria do Meio Ambiente, 1991).

This conservation unit occupies a large territorial area of towns belonging to the Bragantina region and it includes the area where the Jaguari and Atibaia rivers are located. One of the characteristics of this region is an abundance of water resources of regional and national importance.

The Cantareira System that is located in this EPA, supplies water to a considerable part of the Metropolitan Regions of São Paulo (66%) and Campinas (85%), the largest urban and industrial centers in the country and in continual conflict over water use. Within this context, the collapse of the Cantareira System has become a matter of considerable concern for both the state and federal government.

Although the area where the Cantareira System is located is very close to the Metropolitan Region of São Paulo we can still find considerable remnants of Atlantic Forest, one of the most threatened tropical forests in the world (Câmara, 1993).

Several studies have been carried out in order to understand the environmental reality of the Piracicaba EPA, the present situation of the Cantareira System and its water resources, as well as to propose conservation measures.

Although the creation of this EPA is based on highly justifiable conservation concerns, it has caused significant economic restrictions for local communities. Such restrictions are found in the cases of land use and agriculture and have become challenges that these communities must face. Alternative sustainable sources of income have been proposed, however, few initiatives have been implemented, either by individuals, local NGO's or other institutions.

The economic difficulties that the regional population has been experiencing represent a serious threat to the conservation of areas with forest and water resources. Nowadays, many rural owners are selling their property to real state speculators and tourists. This has caused a considerable increase in environmental damage, as the new owners have no connection to the land and end up causing irreversible impact (Hoeffel & Viana, 1996).

Another aggravating circumstance is that the highway which connects this region to São Paulo – Rodovia Fernão Dias, is under expansion. This fact will facilitate easy access to the area, increasing the threats to an already fragile ecosystem. Similar situations have taken place in other regions with devastating results. In order to avoid same happening in the Bragantina region, all possible efforts should be made.

Among the actions put into practice is a regional development program, based on Agenda 21 developed by The São Paulo Environmental Agency known as *Entre Serras e Águas.* The aim of this program is to minimize the impacts that the expansion of highway Rodovia Fernão Dias may cause. The objectives are to join efforts in order to protect the regional environment and increase the local population's quality of life through promoting meetings that debate regional problems, create solution plans and develop projects to meet local needs.

However, the referred program has not dealt effectively with certain towns within the neighboring state of Minas Gerais also located in the Piracicaba River EPA. This situation makes any possibility of sustainability in the region doubtful not to mention the fact that 70% of the watershed is in the State of Minas Gerais which has been undergoing a rapid process of transformation and suffering various environmental impacts which may compromise the regional water resources.

The State of Minas Gerais government has also created an EPA – the EPA Fernão Dias with the aim of preserving the water resources of this region. However, as in the State of São Paulo, this EPA has not yet been legalized and puts at risk any conservation measures that could be taken. (Almeida e Hoeffel, 1997).

The fact that this region is very near the Metropolitan Region of São Paulo and that it features an exuberant natural beauty has made it a target for real state enterprises, thus increasing the process of land occupation.

This situation justifies the implementation of sustainable tourism activities, which make use of cultural and environmental assets to promote educational activities and environmental protection, as well as to inform and educate tourists about the characteristic features and vulnerabilities of the region, thus helping to both maintain and restore the natural environment and cultural heritage.

The undergraduate tourism course and São Francisco University are both located in this area, and can therefore contribute to discussions on regional environmental

problems and the search for sustainable tourism development options. In order to do this; it is necessary to have a global comprehension of the concrete reality, of local economic activities, an analysis of their suitability and the potential for implementing sound environmental activities.

This implies facing the challenge of becoming familiar with the regional reality and the environmental conceptions of groups active in the region, and to support local groups in adopting sustainable practices.

Education, tourism and environmental research

Educational practices which seek to value and awaken the individual to his/her role in society as an active citizen and agent of change are elements fundamental for creating sustainability.

Milton Santos (1987), points at the importance of education in promoting, what he calls, true humanism:

> *Current and formal education, simplifier of world realities, subordinated to business reasoning, subservient to concepts of success, teaches a humanism without courage, destined to become a doctrine cut off from the real world that surrounds us, condemned to be a silent humanism, out of fashion, incapable of reaching a synthetic view of the existent matter. True humanism must be constantly renovated, not become conformist and be able to give answers to the real aspirations of society that are necessary for the permanent work of the recomposition of the free man, in order that he raises himself to the height of his historical time (Santos, 1987, p.42).*

It is within this context that all academic courses should be carried out defining education as a medium of change, renewal and freedom.

It is up to educators of tourism to stimulate reflection on issues that involve the reality of the places being used touristically and lead to practices within ethical, responsible, conscious and sustainable perspectives.

São Francisco University has been carrying out studies in which education is considered an important factor to bring about learning and responsibility. It involves teachers and students in activities that promote the inter and multidisciplinarity in various courses of study. The following projects are an example:

The undergraduate project for the improvement of learning quality was developed in the year of 2001 in the tourism course. It's aim was to promote the integration between the pedagogical process and academic activities and included the following curriculum components: Guided Practical Activities, Study of the Environment and Technical Visits.

In the guided practical activities the student is led to a practical experience of what was learned within the classroom thus providing an interaction of diverse disciplines. It is emphasized that in order to obtain the expected results it is fundamental that students participate in the planning and execution of the proposed activities.

The technical visits are activities that include visits to public and private tourism organizations, seeking to link theory to practice and a closer contact with the job market and cultural and environmental knowledge.

And finally, the Environmental studies program has been carried out in conjunction with the Tourism and Environmental Impact course studies program. Through these activities, the student is led to understand the area of study, identify the environmental impacts generated by tourism and indicate proposals for the development of sustainable tourism.

The Environmental studies program also aims to demonstrate the contrasts existent in the tourist landscape in order to allow students to feel the need for tourism planning that encourages the participation of the local population and seeks sustainability (Fadini e Hõeffel, 2001).

All these activities include field trips to areas of varying ecological, geographical, historical and touristic characteristics and the elaboration of reports. These activities always take place under the guidance and accompaniment of the responsible teacher.

The referred project has as one it's objectives the development of student writing, the development of the habit of learning by doing, a taste for academic activities through reading, observations and debates among students and teachers, as well as the strengthening of results through an interaction of disciplines.

This project seeks to link knowledge conveyed in class with future professional reality, creating a dynamic and interactive environment that intensifies the teaching-learning process, humanizing professional relations and encouraging students to mature through the exchange of experiences between students, teachers, bcal population and professionals from various visited places.

The fact of being a multidisciplinary project intensifies this process because the social, historical, cultural, environmental and professional values are strengthened. It creates a more capable professional able to solve technical problems, as he knows theory and practice, and is better qualified because he is aware of human values and conscious of the importance of actions that lead to sustainable tourism.

The link between theory and practice has facilitated debates and reflections on a ways of thinking and acting that consider the environment as a whole and offer a systemic view of reality instead of a set of fragments. At the same time this conjunction enhances among students scientific knowledge and brings together the perception of both the environment and tourism.

The multidisciplinary nature of the course within a systemic viewpoint considers the disciplines as an integrated totality wherein the specific structures are the result of the interaction and interdependence of its parts, creating as emphasizes Capra (1982), a web of relations.

Another project that has been carried out by teachers and students involving the undergraduate tourism course program is the environmental project Societies and their concepts of Nature – A study in the Environmental Compartment of the Bragantina Region.

The aim of this project is to present, within a historical perspective, the evolution of the environmental problems in the environmental compartment of the Bragantina region, characterizing its basic structure, the different conceptions about the existent natural world and how they reflect in making practical proposals of

intervention. The project proposes the creation of suitable management plans and a correct landscape prognosis of the referred compartment.

The choice of the area of study is justified by the fact that the University is located within the geographical area presented above.

The survey of the environmental reality of the area includes interviews, data collecting from the existing governmental and non-governmental organizations and field research, in order to identify the cultural, legal, environmental and social-economic characteristics of the region.

Built on a participatory process, this project seeks to identify the regional environmental problems in conjunction with the regional population. The choice of this procedure seeks to encourage the participation of local groups in the various stages of the project, in both its theoretical and practical aspects. It also aims at developing educational action that is concerned with the stimulating of awareness and sustainable environmental practice.

It includes technical training programs, talks and debates, events for the presentation of research results and discussions of action proposals with the various segments of society. Activities involving the general public have taken place in order to rediscover regional values and disseminate proposals for sustainable activities.

The data is being analyzed within a systemic view, seeking to integrate the different aspects – social, economic, scientific, cultural and environmental and therefore create a general picture of the environmental problem in the area of study.

The activities that have been developed include a survey of existing environmentally sound economic activities and the natural and cultural ecotouristic potential. A pilot environmental education program is being elaborated along with a program of action that aims towards the sustainability and protection of the Cantareira watershed.

The University expects, with this project, to contribute in identifying the regional environmental problems and to propose measures to prevent and minimize environmental damage. This action has promoted the integration between the university and the regional community and a better perception of the environmental characteristics of the Bragantina region.

The bringing together of these projects seeks to create a field of reflection, debates, actions and educational practices rooted in the idea of environmental sustainability.

References

Almeida Jr., A. and Hoeffel, J.L. (1999), "Áreas de proteção ambiental e o imaginário", Gestão e desenvolvimento, Vol. 4 No. 2, pp.27-41.

Câmara, I.G. (1993), *Plano de ação para a Mata Atlântica*, SOS Mata Atlântica, São Paulo.

Capra, F. (1982), *O ponto de mutação*, Cultrix, São Paulo.

Cavallari, V. and Zacharias, V. (2000), *Trabalhando com recreação*, Ícone, São Paulo, pp.27-8.

Fadini, A. and Hoeffel, J.L. (2001), "Qualidade da água e turismo – reflexões a respeito do tema", *Anais do I Simpósio e Exposição Internacional sobre Turismo e Desenvolvimento Sustentável dos Países da Bacia Amazônica*, Manaus, Brasil, 2001.

Hall, C.M. and Lew, A. (1998), *Sustainable tourism*, Longman, Harlow.

Hoeffel, J.L. and Viana, R.M. (1996), "Impactos de barragens e transformações regionais", Gestão e desenvolvimento, Vol. 1 No. 1, pp.87-102.

Honey, M. (1999), *Ecotourism and sustainable development*, Island Press, Washington.

Krippendorf, J. (1989), *Sociologia do turismo– para uma nova compreensão do lazer e das viagens*, Civilização Brasileira, Rio de Janeiro, pp.48-63 .

Marcellino, N. (2000), *Estudos do Lazer – Uma introdução*, Autores Associados, Campinas, pp.73-4.

Moesch, M. (2001), "O fazer-saber turístico: possibilidades e limites de superação" , in Gastal, S. (org.), *Turismo: 9 propostas para um saber-fazer*, EDIPUCRS, Porto Alegre, pp.7-26.

Moesch, N. (2001), "Turismo: virtudes e pecados", in Gastal, S. (org.), *Turismo: 9 propostas para um saber-fazer*, EDIPUCRS, Porto Alegre, pp.93-102.

Santos, M. (1987), *O Espaço do Cidadão*, Nobel, São Paulo, pp.42.

Santos, M. (2000), *Por uma outra globalização – do pensamento único à consciência universal*, Record, Rio de Janeiro, pp.112-116 .

Secretaria do Meio Ambiente (SMA). (1991), Projeto de regulamentação e implantação da APA da bacia hidrográfica dos Rios Piracicaba e Juqueri-Mirim, EMPLASA, São Paulo.

Return to Contents

15. Development of Ecological Education at Altai State University for Sustainability

Elena Ilina

Altai State University, Russia

ABSTRACT
The course "Introduction to Cleaner Production" is a part of the System of Permanent Ecological Education existing at the Faculty of Chemistry at Altai State University. The system consists of courses "Environmental Chemistry", "Ecological Chemistry", "Introduction to toxicology", "Protection of the environment" and the following the CP training the course "Introduction to Environmental Management". The initiation of such way of education strategy gives the university possibility to raise preventive environmental management professionals which important for success of sustainable development. Developing the educational course on the basis of the similar course of the International Institute for Industrial Environmental Economics (IIIEE) at Lund University (Sweden), it was possible to transfer the main concepts, approaches, objects and tacks with adaptation according to national and even local differences in economical and societal structure, national culture. Keywords: higher education, cleaner production, environmental management.

CONTENT

We must meet the twenty-first century in a way, which creates the conditions for ecologically sustainable and satisfactory economic growth in a world, which is characterized by rapid changes. This is why there is a pressing need to motivate member of society towards the conservation of the environment. Environmental awareness raising, education and training on a wide scale are required to ensure societal adoption of sustainable development.

In this respect, there is a definite need for well-balanced educational programs for higher education. The System of Permanent Ecological Education is developed at the Faculty of Chemistry of Altai State University.

The Overall Goals of the System

- To provide students with new scientific theories and methods related to their field of practice.
- To offer students knowledge and tools for a new way of thinking in everyday work, which leads to an environmental insight.
- To stimulate students' learning and interaction and develop students' investigative and problem solving skills.
- To encourage young people to reflect more on attitudes, to realize that their own actions, and actions of other people on their society, affect the environment.
- To help students create new competencies and perspectives in their professional work.

The system consists courses:

1. "Environmental Chemistry" which aimed to provide chemical basis for understanding our surroundings, the processes that take place within it, and the kind of changes which come about as a result of human activities.
2. "Ecological Chemistry" which aimed to enhance students' understanding of research strategy and concept of chemicals ecological evaluation.
3. "Introduction to toxicology" which aimed to inform students about the direct toxicological effects, the mechanisms by which they occur, and quantitative aspects defining conditions under which organisms are influenced by chemicals.
4. "Protection of the environment" which aimed to give knowledge about technologies for preventing or eliminating pollution, about standards and laws that set guidelines and limits on levels of contaminants.
5. "Introduction to Cleaner Production" which aimed to give students understanding the main principles of CP and benefits this strategy could bring in comparison with conventional "end-of-pipe" technologies.
6. "Introduction to Environmental Management" which aimed to help students gain an understanding of preventative environmental management strategies (PEMS), to be well prepared, confident and convincingly when arguing that PEMS are always preferable and economically viable.

The system was developing during a few years. The special chemical courses were developed at the beginning. In the past decade, the need for cleaner production environmental management has become increasingly obvious in Russian Federation. The need for well-educated practitioners who can both plan and implement preventive environmental management strategies is a critical issue in Russia.

Cleaner Production training became a result of participation of the Altai State University representative in International Educational Program for Educators on Course and Curriculum Development on Preventive Environmental Management organized by the International Institute for Industrial Environmental Economics (IIIEE) at Lund University (Sweden) in May – June 1999. The program allowed to review existing education curricula and training programs in the field and to develop the course "Introduction to Cleaner Production".

The course was developed on the basis of the similar course in IIIEE and the course on Cleaner Production at the Kaliningrad State University. The course includes the following topics:

- conception of sustainable development in the light of Agenda 21;
- definition and principles of CP;
- advantages and disadvantages of CP;
- role of government in the CP promotion;
- possible barriers for CP development (political, technical, psychological, financial);
- examples of CP projects, CP in different sectors, CP in different regions, international activity;
- role of government in CP promotion;
- environmental policy on industrial, regional and national levels and decision-making process;
- development of CP program within company;

- the main aspects of organization and management of CP;
- Life-Cycle Assessment and cleaner products.

Course Objectives

To understand and practically learn the concept of Cleaner Production, the environmental, economical, organizational benefits, facilitating factors and related barriers.

To demonstrate the historical context of contemporary environment problems and to review the evolution of the preventive environmental management approach.

To relate the concept of Cleaner Production to the similar/alternative concepts of environmental management and different disciplines.

To explore, using concrete examples, how Cleaner Production is being used in different branches of industry and within diverse sectors of society.

To demonstrate the systematic and strategic approaches to promotion and implementation of Cleaner Production.

To examine the roles of different societal actors of the society in helping and/or hindering organizational/societal transition to more sustainable societal patterns.

To understand realities and perspectives for Cleaner Production in different regions worldwide.

To reflect the importance of ethical values for actions towards sustainable society.

The course consists of lectures, discussions, practical works (40 hours totally) and course examination based on individual papers prepared by the participants. It was required from the students to understand the main principles of CP and benefits this strategy could bring in comparison with conventional "end– of – pipe" technologies.

CONTENTS OF THE COURSE ON CLEANER PRODUCTION

Lecture 1. Main principles of Cleaner Production

- Sustainable development in the light of "Agenda 21".
- CP as a real tool to facilitate a sustainable development (in comparison with traditional end-of-pipe approaches.
- Definition of CP strategy (changes o processes and products).
- Successful implementation of CP strategies within different industries.

Lecture 2. Developing and Organizing a Cleaner Production Program

- First steps of a CP program.
- The main problems and obstacles the CP program.
- Creation the CP Task Force.
- State goals.
- Data collection.
- Priorities establishment.

Lecture 3. Environmental policy. Principles and destination

- Term "environmental policy".
- Foreign and Russian national environmental policy and governmental structures responsible for enforcement and realization if this policy.
- An environmental policy of a company, way a CP statement within this policy.

Lecture 4. Preparing the CP program plan

- The organizations and other external groups that might be involved in realization and support of the CP program.
- Objectives needs to have CP program fulfilled.
- Potential obstacles and problems.
- Elements included in the formal written CP plan.

Seminar. Developing and Organizing a Cleaner Production Program

- What we can start with? (discussing question).
- Describe the main problems and obstacles the CP program can face with the discuss of possible drawbacks of CP strategy itself (study case: Altai Food Production Company "Biotech").

Lecture 5. Feasibility Analysis of suggested options

- Technical evaluation.
- Environmental evaluation.
- Economic evaluation.
- An assessment report.
- Financial sources.

Lecture 6. Implementing and maintaining the CP program

- Integrate CP into corporate planning.
- Ongoing staff education programs.
- Support and development of internal communications within the company.
- Program of rewards for personnel for their success in CP.
- Provide public education about CP efforts.

Seminar. Measuring Cleaner Production Progress

- Factors to be considered for normalization.
- Reporting data (different indicators measuring waste shifts, changes in toxicity, environmental indicators, etc.).
- Methods of analyzing the data (quantity of materials received, of waste generated, etc).

Lecture 7. The role of government in the promotion of CP

- Arguments for investing in CP and way for the government to influence the CP development.
- The most important steps of the government for establishing precondition for a CP program.
- Potential actors in CP program.
- The role of regulation and economic instruments in CP promotion.
- Informational and education support.

Lecture 8. Cleaner Products and Environmental design

- Life-Cycle Assessment (LCA)
- Examples of cleaner products.
- "Eco-Product" design process.

Seminar. Energy conservation in the light of Cleaner Production

- Sources of energy in the modern society.
- Wastes produced by energy generation.
- In what way companies can conserve energy.

Practical game "Implementation of a CP program within the company in Barnaul"

- Group working with case of Altai FoodProduction Company “Biotech”.

Examination

The course literature based on the teaching materials on CP training in Russian prepared at IIIEE. The materials contain mostly theoretical (general) part of the course. The materials, published by Russian nongovernmental organization Ecoline also are used. These materials include a systematic description of the international principles and an analysis of Russian experience.

Developing the educational course on the basis of the similar course in IIIEE, it was possible to transfer the main concepts, approaches, objects and tacks with adaptation according to national and even local differences in economical and societal structure, national culture. It means that the content of the material must include as international to national experience in this field. For example, specific internal barriers to turning to Cleaner Production principles for Russian Federation exist:

lack of information and expertise;
low top management awareness of environmental issues or understanding their importance;
competing business priorities, in particular, the pressure for short term profits;
financial obstacles;
middle management inertia;
labour force obstacles first of all caused to low attention to human factor.

External barriers for implementing Cleaner Production can be described as:

a failure of existing regulatory approaches;
a difficulty in accessing cleaner technology;
a difficulty in accessing external finance;
an underdevelopment market for environmentally sound and recycled goods.

These problems are to be considered while developing educational program and in the Russian Federation.

It is necessary to mention that the main principles of innovative teaching methodology (a good balance between theoretical knowledge and practical application) and some tools (discussions, group work, role game, study trip) would enable educator to achieve these principles can be transferred. At least, study trip to the industrial company is very useful form, because it gives possibility to get closer to the real problems existing there. This experience would help students to understand the CP approach much better by applying the theoretical knowledge obtained during the lectures in practice and to write their final papers based upon it.

Differences, national specifity are not barriers for developing such courses. They even stimulated search for new forms and methods and modes. For example, for practical work in this course not theoretical, but real tasks have been used, such as “Developing and Organizing CP Program within teaching chemical laboratory at the Faculty of Chemistry”.

The course is defined as a voluntary one and aimed to student from the Faculty of Chemistry. The closed plans concerning further CP activity implies the organization of the CP training for the target group of post-graduate students of the Faculty (specialty– ecology), for the target group of student of new specialty– “security of vital activity in technogenic world” and for the target group of engineers and industrial services from local industries formed by Altai State Center of the Environment Protection.

The course “Introduction to Cleaner Production” is a part of the System of Permanent Ecological Education existing at the Faculty of Chemistry at Altai State University. The system consists of courses “Environmental Chemistry”, “Ecological Chemistry”, “Introduction to toxicology”, “Protection of the environment” and the following the CP training the course “Introduction to Environmental Management”. The initiation of such way of education strategy gives the university possibility to raise preventive environmental management professionals which important for success of sustainable development.

Elena Ilina
Associate Professor, Department of Inorganic Chemistry
Altai State University
Address: pr. Lenina 61, Barnaul 656099, Russia
Fax: +3852-22-28-75
E-mail: iljina@chemwood.dcn-asu.ru

Return to Contents

16.The Role of Community Service Learning in Sustainable Development Programmes

Rev. C.D. Jaftha & Dr M.A. Erasmus

University of the Free State, Bloemfontein, South Africa

Presenters:

Rev. C.D. Jaftha (Chief Director) & Dr M.A. Erasmus (Professional Assistant)
Directorate: Community Service
University of the Free State
P.O. Box 339
Bloemfontein 9300

Tel.: +27 (051) 410 2474 & +27 (051) 410 3732
Fax: +27 (051) 444 0740
E-mail: jafthacd.rd@mail.uovs.ac.za & erasmusm.hum@mail.uovs.ac.za

Keywords: ***transformation of HE; social responsibility; community service programmes; service learning; partnership model; increased participation; responsiveness.***

Abstract

The scope, range and number of development initiatives at a traditionally 'white' university, such as the University of the Free State (UFS), are evident from a recent survey. This 'proliferation of projects' increased since cuts in government subsidies to higher education (HE) institutions necessitated the obtaining of additional funding for research and other academic activities. The corporate sector, donor organisations and countries are responding to this development thrust in projects through their Corporate Social Investment and other aid programmes. However, sustainability has always been an issue in development initiatives and the quest for ways to achieve this objective continues. This conference is a case in point.

In this paper, the following stance is taken on sustainability: The UFS and its partners believe that the integration of development projects with community service learning and research programmes, within a partnership model, increases the sustainability of such projects by procuring the sustained involvement and accountability of all stakeholders.

The impact of globalisation, as well as the democratisation of South Africa, compelled Government to reconsider the role of HE institutions in the reconstruction and development of the country. According to national policy documents, Government's HE transformation agenda rests on the following three pillars: broader participation, greater responsiveness and an increased emphasis on partnerships (i.e. with the community, public and private sectors). This paved the way for a shift from development projects towards partnership programmes in HE (the NEPAD idea on a local level), enhancing mutual, joint development and reciprocal capacity building for all participants.

The first paradigm shift of the HE transformation process was towards an open system of knowledge generation and application in dynamic interaction with community interests. The next paradigm shift that must be brought about is the integration of community service with teaching/learning and research. The aim of this is to promote and establish problem-solving, socially relevant teaching/learning and research programmes as core functions of these institutions.

Internationally and nationally, concepts such as *service learning*, *community-based education* and *community service programmes* are increasingly being used to refer to this new paradigm as a key mechanism for said integration. The *Education White Paper 3* (July 1997) specifically mentions such programmes in S. 1.27(8) and 1.28(5) – referring, inter alia, to the need for institutions of HE to demonstrate their "commitment to the programmes". The integrated, holistic approach of community service learning, teaching and research is an apt response to this initiative.

At the UFS, community service has been identified as a strategic priority and a core function, which must progressively be integrated with teaching, learning and research as mainstream activities of the university and its students. In this presentation the ways in which service-learning programmes can enhance the sustainability of development initiatives will be explored and practical examples of such endeavours will be provided. The basic notion is that exciting new avenues towards sustainable development programmes rest on the following key principles:

- **Partnerships and participation**: through service learning and research programmes, development goals become a meaningful part of the long-term interests of all stakeholders.
- **Responsiveness** to real needs identified by communities and other sectors of society.
- **Social responsibility** of HE institutions, demonstrated by the well-managed integration of development initiatives in academic functions (learning, teaching and research).

The Role of Community Service Learning and Research (CSL & R) in Sustainable Development Programmes

Presenters: Dr M.A. Erasmus & Rev. C.D. Jaftha
University of the Free State, Bloemfontein, South Africa

"We learn and serve in partnerships for sustainable development"
(Slogan for CSL & R at UFS)

1. Introduction

The scope, range and number of development initiatives at a traditionally 'white' university, such as the University of the Free State (UFS), are evident from UFS surveys that were conducted over the past five years. This 'proliferation of projects' increased since cuts in government subsidies to higher education (HE) institutions necessitated the obtaining of additional funding for research and other academic activities. The corporate sector, donor organisations and countries are responding to this development thrust through their Corporate Social Investment (CSI) and foreign aid programmes. However, sustainability has always been an issue in development projects and the search for ways to achieve this objective continues. The theme of this conference is a case in point.

In this paper it is argued that sustainability through the involvement of universities could be enhanced if the following routes are explored:

- The UFS and its partners believe that the integration of development projects in Community Service Learning and Research (CSL & R) programmes, within an inclusive partnership model, increases the sustainability of such projects by procuring the sustained involvement and accountability of all stakeholders.
- Managing the environment (natural, social, cultural etc.) with a view to sustaining or securing the livelihoods of present and future generations, is a complex enterprise demanding the forging of new alliances between HE institutions and all other relevant sectors (local communities, the public and private sectors, as well as the international community).
- The sustainability of universities largely depends on whether or not they can play a meaningful role in environmental management and sustainable development programmes.

2. The transformation of Higher Education in South Africa

At the beginning of the 21st Century, South Africa is simultaneously challenged by globalisation trends and local development needs, both of which can be addressed effectively only by participation and involvement of the widest possible variety of interest groups in the country. The unique, decisive contribution of institutions of higher learning to this dual enterprise lies in a national vision of a transformed, democratic system of higher education which will, by the advancement and utilisation of all forms

of knowledge and expertise, contribute to finding **sustainable** solutions for the diverse demands of the local, national, southern African and African contexts.

When considering the impact of globalisation, it might be more accurate to refer to "the globalization of the market economy and the threats to, as well as opportunities for, human welfare that follow in the wake of it" (Hydén, 1999: 151). This phenomenon, as well as the relatively recent democratisation of the South African society, compelled Government to reconsider the role of HE institutions in the reconstruction and development of the country. According to national policy documents, Government's HE transformation agenda rests on the following three pillars:

1. ***Increased participation:*** The democratisation of and increased participation in the higher education system by an ever-increasing diversity of interest groups which aims to eradicate the inequalities of the past.
2. ***Greater responsiveness:*** The ability and willingness to react to a wide variety of social and economic needs, as well as a commitment to seeking solutions to societal problems which in turn require adaptations in respect of teaching and learning methods and curricula.
3. ***Increased co-operation and partnerships:*** Increasing co-operation and partnerships between institutions of higher education and all sectors of society (i.e. with the community, public and private sectors) for the sake of mutual trust, as well as increased accountability and transparency in the higher education sector.

(Cf., inter alia, the *National Commission on Higher Education Report*: *A Framework for Transformation*, 1996, and the *Education White Paper 3*, subtitled: *A Programme for the Transformation of Higher Education*, 1997.)

The first paradigm shift of the HE transformation process was towards an open system of knowledge generation and application, as well as a new mode of knowledge production in dynamic interaction with community interests. In this open system credits can be earned in learner-centred, outcomes-based teaching/learning programmes, which are continuously modified so as to be in line with changing societal needs. Institutions of higher education in South Africa have to a large extent already made the necessary modifications.

The next paradigm shift that must be effected is the integration of community service into teaching/learning and research. The aim of the integration is to promote and establish problem-solving, socially relevant teaching/learning and research programmes as core functions of these institutions.

This new agenda paved the way for a shift from development projects towards partnership programmes in HE (the NEPAD idea on a local level), enhancing mutual, joint development and reciprocal capacity building for all participants.

3. Community Service Learning and Research (CSL & R) – a partnership approach

Internationally and nationally, concepts such as *service learning*, *community-based education* and *community service programmes* are increasingly being used to refer to the new paradigm as a key mechanism for the integration of community service with teaching/learning programmes in HE. The *Education White Paper 3* (July 1997) specifically mentions such programmes in striving to achieve the two following transformation principles (emphasis added):

1. On national level, the aim is to cultivate a sense of civic responsibility in students: "To promote and develop **social responsibility and awareness** amongst **students** of the role of higher education in **social and economic development** through **community service programmes**" – 1.27(8).
2. At institutional level, the social responsibility of institutions of higher education is at stake: "To demonstrate **social responsibility** of **institutions** and their **commitment to the common good** by making available expertise and infrastructure for **community service programmes**" – 1.28(5).

The integrated, holistic approach of community service learning/teaching and research is an apt response to this initiative, and the fact that a partnership approach is another essential aspect of these programmes, is conducive to sustainability as well as accountability. Therefore the UFS has identified community service as a strategic priority and a core function, which must progressively be integrated with teaching, learning and research as mainstream activities of the university and its students.

According to a **wider definition of community service (CS)**, this concept encompasses any form of making available the resources and capabilities of the UFS to the wider public. In view of the national paradigm shift referred to above, the UFS would, however, in future wish to formulate a narrower definition and, where possible, integrate it with teaching/learning and research in CS programmes. The more narrowly focused definition of integrated CS programmes used by the UFS is the following:

Integrated CS programmes denote -

- the **mutual and reciprocal obtaining of competencies** (knowledge, skills and dispositions/attitudes)
- by **all members of the partnership** (UFS lecturers, students, members of communities and service sectors)
- in **teaching/learning and research programmes**
- aimed at better understanding and solving **community needs and challenges**
- by means of **available expertise, resources and infrastructure**.
- Viewed in the light of the immediate socio-economic context within which the UFS functions, a **predominantly development-oriented approach** will enhance the **relevance** and value of these integrated CS programmes.
- These programmes are firmly based in **interdisciplinary, intersectoral efforts** to find **local solutions** to the **national and global challenges** of **securing the livelihoods** of all people through environmentally sustainable actions.

Who are the participants/partners and what do they contribute to the CSL & R programmes?

(1) The **Department of Education -** the source of legislation and regulations through which CS programmes are promoted. This Department also initiated the national CHESP (= Community-Higher Education-Service Partnership) programme through the Joint Education Trust (JET), which currently spearheads integrated community service learning programmes throughout the country.
(2) **Institutions of higher education** (i.e. UFS) and their lecturers/researchers, other staff members and students, who make their expertise available in their various academic disciplines for purposes of learning and sharing knowledge within the partnership.
(3) **Local communities (urban and rural**), as well as the Community-based Organisations (CBOs) who represent them. They contribute in terms of experiential knowledge gained through facing community challenges and finding innovative ways of dealing with such challenges.
(4) The **public service sector** - national, provincial and local governments. In partnership with this sector, joint efforts are made to improve service-provision over a wide spectrum and the training of professionals for the sector becomes more relevant.
(5) The **private sector**: the corporate sector, industry, NGOs, etc. This sector's involvement includes funding of development initiatives within Corporate Social Investment programmes, but could entail more (cf Botes, 2002, on the extended role that the corporate sector should play to sustain the development projects that they fund).
(6) The **international community**: foreign donors etc. Within the globalised environment, local (micro) issues assume their rightful status as challenges of national and global importance.

Bringing partners from such divergent constituencies together within Community Service Learning and Research programmes is a rather daunting task. According to Bringle and Hatcher (2000: 275), well-planned and carefully managed strategies are necessary and different activities should be designed **to develop each stakeholder so that their involvement in service learning is sustained as a meaningful part of their long-term interests**. This is the way in which service learning will become integrated into the broad spectrum of teaching, research and service activities. It will also become an institutionalised component of higher education, as well as form a broad partnership from the various sectors mentioned above.

The UFS distinguishes between the following two main categories of CS:

CATEGORY A: Integrated CS projects and programmes i.e. teaching/learning integrated into curricula and linked to learning programmes, as well as CS research. There are the following subcategories:

1. *Compulsory practicals:* A student receives a salary from the state (e.g. the community service year in medical training).

2. *Internships:* Mostly postgraduate internship programmes offering students opportunities to start applying their theoretical knowledge practically after obtaining a basic degree qualification.
3. *Core modules:* Compulsory learning programme-linked practicals linked to (CS learning) credits (e.g. within the Faculties of Health Sciences and Law).
4. *Electives:* Optional CS modules within certain programmes/courses which are linked to credits (e.g. in the case of the CHESP programme);
5. *Fundamental modules:* The possibility will be looked into of also accommodating CS programmes within this category of modules.
6. *CS research:* Needs-based, socially-rooted research projects and programmes, aimed at finding sustainable solutions to community challenges, which should also contribute to curriculum development. (So-called Mode 2 research, in which the emphasis falls on responsiveness and relevance in respect of national and local community needs. Such research is favoured in the new national funding regime for research, inter alia by the National Research Foundation.)

CATEGORY B: Extracurricular community involvement i.e. CS rendered outside of teaching/learning and research programmes. There are the following subcategories:

1. CS ('community service' as humanitarian aid) by lecturers and/or students done on a *voluntary basis* and which falls outside learning programmes. KOVSCOM's (i.e. UFS students' volunteer programmes) activities fall mostly within this category and represent valuable volunteerism.
2. *Consultancy services* by UFS staff, often with remuneration, for the use of their expertise in the community context.
3. *Work sessions* (or short, non-accredited courses) conducted between an academic and the community (e.g. the continued training of teachers by the Research Institute for Education Planning).
4. *Contract research* on community issues and needs, for which remuneration is received and which is not integrated into learning programmes.
5. The management of *development projects* by members of staff (funded by outside agents).

The UFS is of the view that some of the above types of CS activities could potentially be linked to student learning programmes and/or contribute to curriculum development. Such re-orientation is strongly recommended and encouraged.

In the rest of this presentation, the ways in which such Community Service Learning (CSL) programmes enhance the sustainability of development initiatives will be explored and practical examples of such endeavours will be provided.

4. Defining 'development' and 'sustainability' within the CSL framework

The UFS views 'development' as a dynamically interactive, reciprocal learning process between its teaching staff, students and partners in society (communities, service sectors, etc.). The concept represents a concerted desire to offer all people the

opportunity to achieve the best quality of life possible, given the realities of their material circumstances. The right to live a meaningful life, as defined by those concerned, is central in this undertaking. The following citation serves to further elucidate the concept, as defined within the CS policy of the UFS:

"Development must be firmly based on human well-being, and in terms of this premise, any development programme will have to focus on the people's own definitions of human well-being" (Coetzee, 1996: 143-144).

A participatory approach is essential, as the idea that one of the partners has a monopoly on the generation of knowledge, no longer exists in the new paradigm. The premise, therefore, is that previously disadvantaged communities, which traditionally qualify for development aid, contribute fully to the reciprocal process of collective growth and development of all partners. Behera and Erasmus (1999: 6) emphasise this by proclaiming that "real development would be ecologically sustainable and pro-people" and that "the path and pace of development, as well as the decision-making, must be left to the people concerned".

The undeniable link between poverty and environmental degradation/destruction brings the need for sustainable development firmly within the sphere of environmental management. According to Behera and Erasmus (1999: 2) poverty often contributes to environmental stress, to such an extent that "(p)overty and environmental stress are becoming inseparable twins". True development should thus be grounded in a "moral economy" of providing for the needs of the people through "ecologically sound programmes" (Behera & Erasmus, 1999: 7). The sad fact is that inequalities in access to resources "confine a large number of people to poverty which often leaves them with no choice but to degrade and destroy the resource base on which their future livelihoods depend" (Behera & Erasmus, 1999: 6). Development and environmental issues thus go hand in hand and it would seem as if 'sustainability' serves as the mediating term, the bridge between 'developers' and 'environmentalists'. But how do we define sustainability?

Behera and Erasmus (1999: 3-4) suggest several definitions of 'sustainable development'. The following two are singled out for purposes of this presentation:

(1) Sustainable development is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development, 1987)
(2) "Sustainable development (…) encapsulates the realisation that to achieve the goals of either conservation or development, the welfare needs of the poorest groups must be addressed."

Svedin (1999: 167) points out that the various dimensions of sustainable development include the following: the biophysical dimensions; the socio-economic societal frameworks; the knowledge base and the value base from which human interference with the natural world is drawn; as well as cultural preferences, norms and underlying meanings. In addition to this inclusive perspective on sustainable development, the interrelatedness of the micro and macro levels should be considered; i.e. the fact that

social security (including political, economic, cultural and environmental security) of states, communities and individuals are interrelated issues that have to be studied in a holistic, interdisciplinary manner. Hence we propose that the major challenge of searching for sustainable ways of securing the livelihoods of communities and individuals, without compromising the environment, could best be approached through inclusive partnership models such as that provided by Community Service Learning and Research.

5. Examples of CSL programmes at the UFS

The basic notion of this paper is that exciting new avenues towards sustainable development programmes rest on the following key principles:

(1) **Partnerships and participation**: Through sustained service learning and research programmes, development goals become a meaningful part of the long-term interests of all stakeholders.

(2) **Responsiveness** to real needs identified by communities and other sectors of society.

(3) **Social responsibility** of HE institutions, demonstrated by the well-managed integration of development initiatives in academic functions (learning, teaching and research).

The ideal situation that the UFS is striving for in its CSL programmes is that communities participate as full partners, have a full say in both the identification of needs and the concerted search for sustainable solutions to these challenges. All CSL programmes should be integrated into community needs and participation, with partnerships in service sectors. (The best UFS example is the MUCPP, or Mangaung-University-Community Partnership programme. Cf. the presentation of our colleagues, Wessels and Mokoena.)

CSL & R programmes are up and running in most UFS faculties. The best progress has been made within the Faculty of Law (i.e. legal practice programmes) and the Faculty of Health Sciences (medical students: community service year; nursing students: throughout their training involved in community programmes). The Faculty of Humanities (inter alia the Departments of Sociology, Social Work, Education, the Unit for Language Facilitation and Empowerment – cf. e.g. below) and the Faculty of Natural and Agricultural Sciences (cf. e.g. below) are in different stages of development. There is scope for programme development in every faculty with regard to this new paradigm. However, in many instances the interdisciplinary and intersectoral (partnership) approaches are not well established as yet.

The following three examples of CSL & R programmes at the UFS should give some insight into the approach that is aimed for. (For more detail about the programmes, please consult the Community Service web page, which can be accessed from the home page of the University at **www.uovs.ac.za**)

Example 1:

Language empowerment programmes for local government in the Free State

In this partnership programme, the University sustained its language empowerment project LOGTIS (Local Government Translation and Interpreting Service project), which was funded by the Flemish Community Government over a period of three years, by entering into a very successful partnership with the Free State Department of Local Government and Housing and municipalities of the Free State. Capacity building through training and internship programmes for students (funded with donor money) lead to job creation for several language practitioners. Thus the utilisation of external funding as seed money to establish language services and language management programmes at local government level, within the CSL & R model, could be regarded as a successful endeavour to find local solutions to the national and global threat of linguistic and cultural domination and marginalisation.

Example 2:
The Philippolis CSL & R programme (FSRDPP)

The *Free State Rural Development Partnership Programme* (FSRDPP) in the rural town of Philippolis, which is managed by the Department of Social Work (UFS), has the potential to become the UFS's flagship programme for rural environments in future. This programme focuses on the needs of farm workers and their families through involvement of a lecturer and students of the Department. The students include the practical experience that they gain there as part of their professional training. One of the NEPAD priorities is the creation of prerequisites for sustainable development: Peace, security, democracy and political governance. As the case of Zimbabwe shows, the welfare of farm workers is an important stabilizing condition for sustainable development. This partnership programme provides a model for similar participatory action programmes to be duplicated in other regions.

Example 3:
The Etsa Phapang ("It makes a difference") CSL & R Programme

Within the Faculty of Natural and Agricultural Sciences, the Etsa Phapang project, which can be defined as a peri-urban agricultural development programme, provides an excellent example of what can be achieved through interdisciplinary cooperation. This project currently involves, inter alia, hydroponic and ordinary food garden production of vegetables and cut flowers, agricultural management programmes and value-adding to agricultural food products (i.e. the processing and packaging of vegetables). Lecturers and students of the following UFS departments are involved at the site in what used to be the Mangaung township: Zoology and Entomology, Microbiology, Biochemistry, Food Sciences and the Centre for Agricultural Management. The Department of Building Construction at the Technikon Free State is also a partner, together with several funders from the corporate sector. Community involvement is of the essence and is sustained through the community learning service site at the MUCPP.

The Etsa Phapang project provides further proof that a holistic partnership approach opens up new, innovative possibilities of putting theory into practice in more useful, sustainable ways. Within this project there are several service learning templates that form part of the national CHESP (= Community-Higher Education-Service Partnerships) programme, which is coordinated by the Joint Education Trust (JET).

The UFS's involvement and participation in the national CHESP programme is geared towards bringing its CSL & R programmes in line with national initiatives in this exciting new field. Nuttall (2001) defines this programme thus: "The (CHESP) partnership programme aims to further the transformation of South African **universities** towards *sustained community engagement* in their curricula, to develop local **communities** as sites of civil society, and to enhance the provision of appropriate **services** in those communities." A significant joint project of JET is MERP (Monitoring and Evaluation Research Programme) for the CHESP templates at the various participating universities which provides a sound system of programme evaluation to monitor the impact of the service learning programmes on all participants.

(Please note that more CSL & R programmes are listed in our database on the web page that was referred to above.)

6. Conclusion: Fearless scholars required

Environmental management for sustainable universities? The role of HE in sustainable development? If the two components of the conference theme are viewed in juxtaposition, one cannot help but see the interdependence between communities in need of sustainable development programmes and universities in (dire) need of a meaningful role and contribution to society, in order to sustain themselves through responsiveness and relevance. The new paradigm of integrated CSL & R within a partnership model could go a long way towards achieving both these objectives.

In the following quotation from Hydén (1999: 150), a global perspective is added to the role that universities could play in sustainable development:

"The growing realization that individual livelihoods and the fate of local communities can no longer be viewed in isolation from national or international structures and processes has given rise to **new forms of scholarship** in which micro and macro considerations are being combined to provide fresh perspectives and insights on issues that previously were studies in isolation from each other."

The voices of Behera & Erasmus (1999: 4) can be added here. Their basic argument is that "indigenous and scientific knowledge are complementary in their strengths and weaknesses and that combined, they may achieve what neither would alone". Thus the challenge of managing the relationship between knowledge and action, and taking into consideration their connections to norms, cultural frameworks and ethical considerations, also comes into play. Small wonder that Svedin (1999: 171) very aptly

declares that all this has to be done by "a scientific constituency which is not afraid of facing new alliances even outside academic confines".

To conclude: In South Africa we now need 'fearless' scholars with a firm commitment to the 'common good'. They should not be afraid to either leave the comfort zones of their laboratory or lecture room, or to give up the hegemonic position of scientific knowledge. They should be brave enough to take outcomes-based education one - inevitable – step further, i.e. to include community-based education and the holistic, interdisciplinary, intersectoral approach of Community Service Learning and Research.

LIST OF REFERENCES

(AAHE). American Association of Higher Education (1997-2000). Series on Service-Learning in the Disciplines. (www.aahe.org)

Behera, D.K. & Erasmus, P.A. 1999. Sustainable development of indigenous populations: challenges ahead. *South African Journal of Ethnology*, 22(1): 1-7.

Botes, Lucius, 2002. Partners in Development as a means to achieve Corporate Social Investment. ABSA Free State CSI networking event. 15 March 2002.

Boyer E.L. 1996. The scholarship of engagement. *Journal of Public Service and Outreach.* 1: 11-20.

Bringle Robert G. & Hatcher, Julie A. 2000. Institutionalization of Service Learning in Higher Education. The Journal of Higher Education 71(3): 273-290. (May/June 2000). The Ohio State University.

Bringle R.G. & Hatcher J. 2001. *Reflection activities for the college classroom.* Indianapolis: Center for Service and Learning.

(CHE, 2000). Council on Higher Eduation. 2000. Founding Document. Higher Education Quality Committee. Council on Higher Education. (http://education.pwv.gov.za/CHE/heqc/FoundJan.html)

(CHE, 2001). Council on Higher Education. *Founding Document of the Higher Education Quality Committee* (HEQC), January 2001.

Coetzee, Jan K. & Graff, Johann (eds). 1996. *Reconstruction, development and people.* Johannesburg etc.: International Thomson Publishing (SA).

(DACST, 1996). Department of Arts, Culture, Science and Technology. *White Paper on Science and Technology. Preparing for the Twenty-First Century.* Pretoria: Government Printer.

(DoE, 1997). *A programme for higher education transformation.* Department of Education: Education White Paper no. 3. *Government Gazette,* Volume 386, number 18207, Pretoria, July 1997.

(DoE, 2000). Department of Education (March, 2000). Funding of Public Higher Education: A
New Framework. Ministry of Education, Pretoria.
(http://education.pwv.gov.za/DoE_Sites/Higher Education/National-Plan)

Eyler J., Giles D.E. & Gray C.J. 1999. *Research at a glance: what we know about the effects of service-learning on students, faculty, institutions and communities, 1993-1999*. Vanderbilt University.

Foos C.L. & Hatcher J.A. 1997. *Service learning workshop curriculum guide*. Indiana Campus.

Granfelt, TiiaRiitta (ed.). 1999. *Managing the Globalized Environment. Local Strategies to Secure Livelihoods.* London: Intermediate Technology Publications.

Hydén, Göran. 1999. Environmental awareness, conflict genesis and governance. In: Granfelt (1999): 150-163.

(JET, 1999). Joint Education Trust. (1999). Community, Higher Education, Service Partnerships.Project Description. JET-CHESP. (chespinfo@iafrica.com). (chespinfo@iafrica.com).

(JET, 2000). Joint Education Trust. (2000). Report on the Meeting of Vice Chancellors on the Direction for Community Service for Higher Education. JET-CHESP. (chespinfo@iafrica.com).

Kraak A 2000. *Changing modes: new knowledge production and its implications for higher education in South Africa.* Pretoria: Human Sciences Research Council.

Lazarus, Jo. 2001. A New Contract between Higher Education and Society: Responsiveness through a Scholarship of Engagement. Paper presented at the 3rd Consultative Conference of the Council on Higher Education. 29 & 30 Nov.

(NCHE, 1996). NCHE Report. National Commission on Higher Education: A *framework for transformation.* 1996.

Nuttall, Tim. 2001. Moving community-based learning into the mainstream university curriculum: South African opportunities and challenges. Paper presented to the Social Science Curriculum Reform Conference, Ford Foundation Social Sciences Project, Pretoria, 26 Sept.

Perold H. 1998. *Community service in higher education.* Johannesburg: Joint Education Trust.

Student handbook. 2001. Center for Community Service and Service Learning. South Orange, New Jersey: Seton Hall University.

Svedin, Uvo. Culture, cultural values, norms and meanings – A framework for environmental understanding. In: Granfelt (1999): 164-172.

Wils F. 2001. *Empowerment and its evaluation: a framework for analysis and application.* The Hague Institute for Social Studies (Working Paper Series no. 340).

Working together, creating knowledge: the university-industry research collaboration initiative. Business-Higher Education Forum.

Title: **The Role of Community Service Learning in Sustainable Development Programmes**

This paper looks at ways in which integrated service-learning programmes at HE level can enhance the sustainability of local and regional development initiatives. Practical examples of such endeavours in the Free State province will be provided. Increased co-operation, partnerships and participation, social responsibility and greater responsiveness to community needs are considered as key principles leading to the sustainability of development programmes. This is set within the context of the impact of globalisation, as well as the democratisation of South Africa, and how government has been compelled to reconsider the role of HE institutions in the reconstruction and development of the country.

Authors: Rev. C.D. Jaftha and Dr Mabel Erasmus, Directorate: Community Service, University of the Free State, Bloemfontein, South Africa

Return to Contents

17. Environmental benchmarking in HUMANE/ COPERNICUS universities

Betty de Keizer

University of Amsterdam, Holland

Introduction

In this paper we set out the problems and challenges that we face when attempting to improve the traditional processes of university management so as to reach a management model that is more firmly based on the idea of sustainability.

As a first step we will clarify the underlying vision. We argue the case for an unambiguous approach to sustainability in university management and - linked to that - the need to develop specific, unambiguous performance indicators for each target group involved. As part of this, we outline some ideas on the categorisation of different target groups within the university community and their role in the implementation of sustainability within university management processes, focussing on the role of university administrators. This will lead to a fuller presentation of the ESMU/ HUMANE proposal of environmental benchmarking within their member universities.

A brief word of introduction may be useful on the HUMANE[11] network. HUMANE was set up in 1997 with the aim of grouping all heads of university administration in Europe in an informal network devoted to professional development and best practice. In its early years the network received significant encouragement and financial support from the European Commission, notably under the Socrates Thematic Networks Programme. The original proposal included 24 universities, but that number has now risen to approximately 200.

Two bodies with different roles, the Round Table and the Executive Committee, determine the policies of the Network. Each participating country has at least one place on the Round Table, with additional seats depending on the number of members in a given country. Members of the Round Table are elected by their national colleagues for periods of 3 years. The Executive Committee meanwhile has eight seats. Round Table members representing constituencies based on geographical and cultural groupings of the member countries take six of these, while the chairperson and an ESMU representative take the other two. At present the roles of both the chairman and the network manager are assured by the University of Amsterdam.

Within the HUMANE network, information on university management skills is exchanged in a variety of ways including a discussion list, but notably by means of regular seminars on set themes. There are six seminars each year, and one of the core

[11] HUMANE stands for Heads of University Management and Administration Network in Europe

subjects that have received particular attention over the last four years is the issue of how to improve the environmental performance of university management. The network also organises Working Groups, which produce annual reports on topics such as transport strategies in universities, and these groups often base their work on surveys of member institutions. By these means HUMANE members exchange information about the mechanisms of university administration in general, and in certain areas the linked study of environmental issues will allow them to improve the university's environmental management process. In particular the results of a major study carried out in 2001 showed us not only that daily reality is much more resistant to change than a purely theoretical view would have suggested, but also that an unambiguous definition of sustainable management is missing. For example, at what level, and on what basis, can one say that a particular university process is environmental friendly, and that the university itself can truly be seen as a "Green Campus"?

Very little work has so far been done to develop useful environmental performance indicators that might help university managers improve the university process seen from an environmental point of view. It would seem that the tools are currently missing to ensure attention for environmental management and to implement sustainable management. In addition to this a lack of knowledge further on in the management chain contributes to the complexity of the implementation process. The proposed project described below would carry out a survey of good practices that will help university heads of administration to integrate environmental management into the university process.

Departure points

It is obvious that a lot of initiatives have been taken during the last ten years. Nevertheless most universities do not seem to have internalised the environmental starting points as part of an overall structural approach.

Despite conventional wisdom, we would suggest that it is not a lack of concern or interest, which is the main reason for this failure. On the contrary, the huge number of initiatives that have been taken in the past, varying from activities with a focus on educational activity through to a more systematic integration of university management processes, indicate that today a great many professionals are working to improve university processes into a more sustainable mode of operation. At the same time it is evident that since more (semi -) professionals started to be involved in this area of work, a set of different points of view entered into the professional area of sustainable management of higher education institutions. A corresponding confusion of language consequently occurred concerning the main focus of sustainability projects. Although a very clear definition of what sustainability means seemed to have been set out some fifteen years ago by the Brundlandt Commission[12], it turned out that to translate the notion of sustainability into the concrete operational activities of daily business

[12] Annexe 1, Summary of proposed legal principles for environmental protection and sustainable development adopted by the WCED Experts Group on Environmental Law, submitted to the General Assembly of the United Nations for its consideration during its 42nd Session in the fall of 1987

processes many interpretations of the definition of the Brundtland Commission can be found.

Going a bit further, it is of fundamental importance that the lack of useful, unambiguous guidelines and definitions, focussing on the specific situation and position of higher education institutions, and also on the different target groups within universities, causes different levels of approach. Talking about sustainability means ... everything, and therefore at the same time it means nothing! Sustainability as a definition covers a whole range of activities and ideas, not only associated with many related issues, but also interwoven in all university activity. What are we aiming at in these various projects, which we undertake with such enthusiasm? On what or on who are they focussed? Do the projects focus on educational activities in such a way that the content will be of a more sustainable character, or do they aim to develop tools for students to improve their general insights into sustainability processes. Maybe the project is not focussing on students at all, but instead of that is dealing with specific operational processes such as waste management or energy management. It is this large potential range of initiatives, which causes the linguistic and managerial confusion.

It is very important to bear in mind that within university society different target groups can be seen. For the educational part students and teachers/ professors take the key positions. Their main concern is the content of the lectures. Researchers are another very important target group, but they do have different needs and problems from those of the first group. And the operational staff form the third key group of players. Each group needs a different approach; each group is involved in different parts of the process of implementing sustainability into university activities. To be successful it is strongly recommended to split up activities into different aspects of environmental concern, so that these activities will fit within the daily situation of the target group in question.

There is no doubt that a greater range of unambiguous criteria and indicators have to be developed specifically for higher education institutions to gain more insights into the measurement of sustainability of their (management) activities. It is also clear that these indicators must be of use especially for the professionals working in the related area. Criteria of sustainability, which are applicable to educational activities, are not necessarily of value for the managers of support services. Similarly, by gaining more insights into the waste management treatment, no clear understanding of the university educational programme is acquired. But, since universities are institutions that have to be examples of good practices to students ("Practise what you preach!"), a clear connection exists between educational affairs and operational processes.

Notwithstanding a few notable attempts – and in this context it is worth mentioning the example of the AISHE project, in which unambiguous criteria on sustainability in higher education institutions are developed to measure the sustainability of an institution - it would seem that very little work has so far been done on developing indicators that are specifically useful both for higher education institutions in their role of educating the next generation on the one hand, while also standing useful guides for different target groups of management professionals.

Several causes can be mentioned for the lack of unambiguous criteria. Firstly - as has been said before - the community of university professionals is very diverse. Things that are relevant to one group of professionals do not have to be of any great value to another, or to interface with the activities of other groups. For instance, university teachers might want to know how they improve the content and the performance of their lectures. Managers, on the contrary, are mainly interested in the supporting processes. The third group of involved personnel, the researchers, will be exclusively focused on their own research programme. Meanwhile, how is one to deal with students, the managers of tomorrow? What do they need to know? What do they need to learn? And, also of some relevance, what do they want to learn on their own? That which is of relevance to one group or professional will very often not be relevant to another group.

Whilst sustainability must be seen as covering the whole range of university activities, and whilst it is also true that sustainable management can be successful only if it links all these different activities to each other in an integrated process, it is evident that to be successful every time the definition of the word sustainability must be looked at from the point of view of each involved target group. In our project the focus is at the level of university administration. What do university administrators need to improve university's environmental performance?

University administrators

Precise terminology will differ between countries, but as a generalisation one can say that – together with the Executive Board, the Rector and other governors - heads of administration are responsible for the overall strategy of the institution. To implement environmental management successfully, the environmental starting points must form a part of that overall strategy. A survey among member universities of HUMANE showed us that although most institutes do have an overall strategy plan, only 24% of respondents also have an environmental plan. Half of this group related it to their strategic plan and covered environmental research, but only one third covered environmental education. Furthermore only 16% of those who answered the questionnaire said that their estate was suitable to meet future environmental demands, with the remainder stating that they were either unsure or that it was unsuitable.

As a second step the overall strategy has to be translated into operational plans. Heads of administration are involved in environmental management in a general way. In the same survey as the one mentioned above it was found that - though compliance with environmental laws was generally good - the environment seemed not to be in the forefront of people’s minds when planning for the future. Heads of administration play a key role in this stage. They have the overview of the institution’s strategies and priorities. Therefore it is their responsibility not only to identify capable staff at the operational level, but also to provide those staff with organisational support, as well as financial and other means. It is not enough that by personal or corporate motivation the top management is convinced of the need to improve the environmental performance of the university. Here too the slogan is "Practise what you preach"!

For heads of administration space management and estate management form an important part of environmental management. For instance the unsuitability and difficulty in adapting old/historic buildings to conform to new energy efficient standards is a point of attention. Quite often energy conservation issues had led to changes in estate strategy! Clear guidelines are needed to be able to make the right decisions to tackle existing problems and needs; not only for short-term decisions, but also looking at the long-term effects. Information about the environmental impact of decisions, information about the expected outcomes, and– particularly important for heads of administration – the financial consequences of any implementation process, since financial management is also part of their role! Financial management in this sense means not only the investment costs and important financial criteria such as the payback-time of various measures, but also as the costs of possible penalties or measures which may later be necessary to undo negative effects of university activities such as wrongful waste treatment, or the removal of asbestos which might have been found in university buildings.

The important role that heads of administration can and have to play to improve the university environmental performance is made very clear in the above description. But then directly the question once again arises - what is good environmental performance? Is it implementing energy saving programmes? Or must prior attention be paid to transport policies? The choices to be made will differ for each institution. Therefore unambiguous standard principles must be developed in which the minimum and optimum level of environmental management are laid down. This gives heads of administration the possibility of having a reference model to compare their own environmental management with. This is called benchmarking. Environmental benchmarking projects could be very helpful for universities to improve their environmental performance.

The Environmental Benchmarking Project

It is difficult and expensive for one university to obtain benchmarking data for itself. Therefore ESMU[13] started a benchmarking programme on university management, launched initially with the Association of Commonwealth Universities (ACU). This sort of programme approach reduces the cost and improves the availability of relevant data. Further, universities wishing to improve can be put in touch with participating institutions with high ratings on particular processes

Benchmarking is a self-improvement tool for organisations. It allows them to compare themselves with others, identify their comparative strengths and weaknesses, and learn how to improve. Benchmarking is a way of finding and adopting good practices. The approach adopted for the benchmarking programme of ESMU goes beyond the comparison of databased scores or conventional performance indicators (SSRs, unit

[13] ESMU is an international non-profit organisation, which beyond other activities transfers expertise on good practices of university management.

costs, completion rates etc.). It looks at the processes by which results are achieved. By using a consistent approach and identifying processes that are generic and relevant, irrespective of the context of the organisation and how it is structured, it becomes possible to benchmark across sectored boundaries (geography, size, mono/multi site institution. etc.).

'Process' is used here to mean a sequence of activities made up of tasks and steps that cross the boundaries between functions, and which serve a valuable and important purpose. For example, the process of attracting and enrolling students may include activities located in an external relations office, recruitment department, registry, departmental administration, and finance office. Within the organisation itself these various offices may appear as discrete, with different line management structures and jealously guarded independence. However, students often see these organisational boundaries as irrelevant (even if they notice them!), and are more concerned with the effectiveness of the overall process in meeting their needs. Much of the strength of benchmarking lays in the way it leads organisations to question the impact of such boundaries on the effectiveness of their processes.

The Benchmarking Programme of ESMU offers a unique and cost effective opportunity for participating universities to compare their key management processes with those of other universities. This will help identify areas for change and assist in setting targets for improvement. Unlike most existing benchmarking initiatives, this programme focuses on the effectiveness of university-wide processes and not narrow departmental functions. It enables participants to learn from each other's experience of difficulties and successes, across international boundaries, in undertaking benchmarked activities. Its mode of operation has been designed by university people solely for use in universities and similar institutions. It is developmental in the sense that each year project members review the methodology and refine it further.

The Environmental Benchmarking project of ESMU/ HUMANE aims to take stock of the expertise of several major European university networks/ organisations active in the field of university management and sustainable development to disseminate to the wider academic community in Europe examples of good management practices for the implementation of sustainable development in universities. Sustainable development does not only cover environmental management ('Planet'), it also involves (occupational) health and safety ('People') and financial issues ('Profit'). The project will look at issues such as energy saving, transport policy, waste management and space management; also it will touch upon the impact that the enlargement of the European Union will have on European environmental policies.

To achieve this objective, a major two-day conference on good management practices to implement sustainable development in university management will be organised. The conference will disseminate the results of a transnational benchmarking exercise, which will have identified such examples of good practices in a number of areas such as those mentioned above, and compiled them into a practical handbook with checklists, indicators, case studies. The conference will gather university decision makers,

managers and specialists in the field of environmental management/ sustainable development.

The project itself will consist of three main activities:

I Defining environmental good practices especially seen from the point of view of heads of university management and administration, based on the analysis and shared insights of seven to ten 'HUMANE/ COPERNICUS universities', all of them well known as being seriously involved in environmental protection activities.

II During the definition process useful environmental indicators will be developed for themes like transport, waste, energy and space management that will be compiled into a questionnaire.
The questionnaire will be sent to selected universities to improve the quality of the indicators on the one hand, but also to collect information about the process of improving environmental management at universities.

III Once the good practices have been collected, and the processes lying beyond the success stories are made visible, the last activity will be the dissemination of results by:

- Producing a handbook of good practice
- Organising a major European Conference
- Creating pages on the ESMU, HUMANE and COPERNICUS websites
- Mailing to academic community at large in Europe, i.e. Rectors, heads of administration, deans of faculty, academic experts, taking advantage of the ESMU, HUMANE and COPERNICUS memberships.

The benchmarking exercise will reach a first group of 50 European universities to which the preliminary questionnaire will be sent. This corresponds to some 150 academic staff (approximately 3 staff in each university will be working on these questionnaires). The conference will bring together some 150 decision makers and specialists from the academic community. In addition to these 300 people directly affected by the project, the practical handbook of good practices will be made available to the academic community at large through mailings to all members of ESMU, HUMANE and COPERNICUS. By making the project outputs available on the websites of the three organisations/ networks, the project will potentially reach the whole higher education community at large in Europe

Betty de Keizer
(with thanks to Trevor Field, University of Aberdeen, for help in preparing the text).

Return to Contents

17. Curriculum Greening at Eindhoven University of Technology

A.F. Kirkels, A.M.C. Lemmens, F.L.P. Hermans, D.A.A. v. Noort, A.H.M. Siepe

Centre Technology for Sustainable Development, Eindhoven University of Technology, Netherlands

Abstract
Eindhoven University of Technology has an extensive program to integrate sustainability in its technical curricula. Most students follow an introductory course in sustainable development. Interested students can also follow optional courses among which is a multidisciplinary project. They can even go for the certificate program.
The introductory course 'Technology and Sustainability' is a multimedia course. Starting from case studies (e.g. the design of a gasification unit) the basics on sustainability are introduced. This way students experience the direct relation between sustainability issues and their technical specialisation. This experience is built out in a multidisciplinary design project, in which students learn to work together in an interdisciplinary way and to deal with real day-to-day problems on sustainability.
Students also have the possibility to follow over twenty optional courses that are related to environmental issues, to deepen their insight into the relation between technology and sustainability and to broaden their view on sustainability.
Students who take the certificate program receive a special certificate beside their diploma. The certificate program takes at least one year of the normal curricula (20%), without doing concessions to the quality of the technological know-how. The program includes the basic course mentioned before and the multidisciplinary project. One of the most important requirements is that the student chooses a topic for his MSc thesis work that is related to sustainable development
The program is introduced successfully in three faculties. In three other faculties the first steps have been taken to incorporate the program. The certificate program has provided a starting point on which there is a continuing effort to green up other courses and to involve more teachers.

Keywords: higher education, technology, sustainability, certificate program, multimedia course, multidisciplinary project.

1. Introduction

In the early nineties, in the aftermath of the Brundtland report (1987) and the Rio conference (UNCED, 1992), it became clear that sustainability was going to be a permanent issue on the global agenda. A change of the public opinion and a growing interest among (non-) governmental institutions and industry started the integration of sustainability in day-to-day societal activities. Universities, as part of society, did not lag behind.

In 1993 the TU/e[14] was one of the universities to sign the Copernicus treaty. COPERNICUS (CO-operation Program in Europe for Research on Nature and Industry through Co-ordinated University Studies) is a program designed to bring together universities and other concerned sectors of society from all parts of Europe to promote a better understanding of the interaction between man and the environment and to collaborate on common environmental issues. By signing the treaty the universities declared to be willing to integrate sustainability into education, research and management. (DHO21, 2002)

The integration of sustainability in education became known as the wish to 'green the curricula'. Greening of the curricula is often seen as the integration of sustainability thinking into all courses and subjects of the different programs. The idea is that sustainability should become an integral part of the thinking of scientists and engineers. Although this intention is certainly good, it introduces the danger that 'greening the curricula' becomes an end rather than a means . The goal of curricula greening is to educate scientists in their specific field of study in such a way that their subsequent professional acting contributes to a more sustainable world. To reach that goal green educational programs should broadly meet the following demands:

- the aim of the program remains a professional training at scientific level;
- the basic issues of sustainability and their relation to the professional training should be introduced;
- the education should train students in the integration of professional skills and sustainable thinking and acting;
- because of the multidisciplinary character of all sustainability issues, education should introduce interdisciplinary thinking and collaboration.

Eindhoven University has focussed on developing a program based on the aims above that could be integrated into all existing educational programs. It became known under the name 'certificate program Technology for Sustainable Development'. The complete program has always been offered to students as optional, but in most of the technical curricula at least parts of the certificate study became obligatory. The certificate program has acted as a catalyst for the greening of courses in the regular programs of the different faculties. The program at the Eindhoven University has been recognised as an effective way of greening university curricula by an advisory committee to the ministry of science and education. This committee investigated the integration of sustainability in the programs of all Dutch universities. It suggested to other universities to follow the Eindhoven approach (RMNO, 2000).

The certificate program and its elements are presented below after some attention has been given to important prerequisites that made the introduction possible. In the last part of this paper results of this approach are presented and conclusions are drawn.

2. Important prerequisites for the greening of curricula at TU/e

[14] Eindhoven University of Technology (TU/e) is one of three technical universities in the Netherlands. It has grown into a technical university with nine departments that have 12 MSc engineering programs and 3 first-degree teacher-training programs. In addition, the TU/e has ten postgraduate technological programs. The TU/e has approximately 3000 employees, 300 professors, 6000 students, 200 postgraduate students, and 450 PhD students. Education is based on the university's own research activities with a focus on design. The TU/e leads prominent Dutch research schools and institutes, and holds a strong position in international networks (TU/e, 2002).

As indicated in the introduction the greening of curricula at TU/e started under a lucky star: the signing of the Copernicus treaty. The top management of the university was convinced of the necessity to integrate sustainability into education, research and management. The commitment was shown in the mission statement of the university: "The Eindhoven University of Technology wants to focus its technological education and research on the enlargement and transmission of knowledge, which serve a sustainable development of the society." (Van Kasteren, 1994)
At the same time the faculties were searching for ways to stimulate research related to environmental problems and to offer educational programs in the field of environment and sustainability. In 1992 almost 2% of all courses at TU/e had learning objectives in the field of environmental problems and environmental technology. In a total of 12% of all courses environmental problems and technology were mentioned (Bestuurscommisie milieutechnologie TUE, 1993).
But the faculties of the TU/e wanted to do more. The university did not choose for a separate program in environmental engineering, but made the choice for integration of sustainability aspects within the existing curricula. In 1994 this serious commitment of the university resulted in the establishment of a Centre Technology for Sustainable Development (TDO). All faculties of the university participated (and still participate) in this centre. The TDO centre reformulated the general mission statement of the university in a more practical goal for educational programs: "The Eindhoven University of Technology introduces new design criteria in all educational programs. Aim is to educate future engineers, so that they can develop technologies that take into account the vulnerability of the earth where it comes to limited resources, natural environment and liveability." (TDO, 2001a)
From 1995 on TDO started with the certificate program. A full description of the certificate program and these courses follows in the next chapters.

3. The certificate program

Based on the broadly formulated goals which are mentioned in the introduction more specific goals were formulated for a program that was open to the students of all faculties. Given the variety of roles that engineers play in society, it is clear that the engineer is confronted with environmental problems and finding solutions. This is why a good knowledge of environmental aspects of the engineer's own speciality is required. Recognising this, the TU/e offers students of all educational programs the possibility to take up a certificate program 'Technology and Sustainability' (TDO, 2001a; Van Kasteren, 1994). Students who follow the certificate program receive a special certificate beside their normal diploma. Students who completed the program should be able to:

- reproduce the essence of the most important environmental problems and possible technical and non-technical solutions for a sustainable future;
- reproduce several relevant environmental problems and research topics concerning sustainable technology for the own field of expertise;
- integrate environmental constraints in the design process in the own field of expertise;

- recognise that a multidisciplinary approach is necessary to design and introduce sustainable technology;
- recognise what other disciplines are important for a design task;
- work in multidisciplinary groups with a task to design sustainable technology.

Students that use at least one year of their normal curricula to study topics relevant for sustainable technology, qualify for a certificate that is formally connected to the MSc-diploma. This way environmental knowledge is added to a sound basis of engineering knowledge. The student will have learned to look further then just the own monodisciplinary knowledge.
The educational aims set, required a specific set-up of the certificate program. This should include introductory courses, in-depth courses, multidisciplinary approaches and integration of knowledge from both the own and other disciplines.

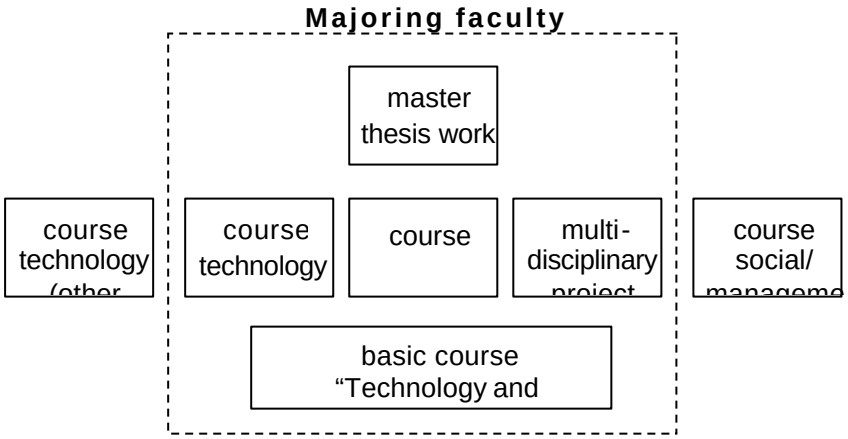


Figure 1 Course program for the certificate 'Technology for Sustainable Development' within the existing educational programs

Figure 1 shows how the certificate program is worked out in a course program. The program includes a basic course 'Technology and sustainability' in which the basic knowledge on sustainability issues and possible solutions to the problems are introduced. Two technical courses on sustainable technology issues provide the necessary depth and the insight in the interrelationship between the own discipline and the possibility to contribute to sustainable technological development. An obligatory choice of a course in one of the other technical disciplines introduces the first multi- or interdisciplinary approach. One course which has to be chosen in the area of (environmental) policy, law, economics or consumer behaviour further broadens the scope from technological solutions to the possible introduction of these solutions in society. For these courses students can choose between twenty optional courses (textbox 1). These courses are part of the existing educational programs in different faculties. Making use of these courses that were developed within a monodisciplinary context guarantees the depth of the program. The last and most important requirement for the certificate program is that the student chooses a topic for his MSc thesis that is related to

environment/sustainability. In the MSc work and thesis the student has to prove the ability to integrate the own disciplinary approach with sustainability issues.
A strong point of the certificate program is that it makes use of existing courses given by scientific staff within the the different faculties who show enthusiasm in combining of technological knowledge and sustainability issues. Only the basic course and the multidisciplinary group projects are organised by the TDO centre. The actual teaching is realised on a 50-50% basis by staff of the centre and staff of the different faculties.

Textbox 1 Optional courses that count for the certificate program (TDO, 2001a)

- International environmental problems
- Regulation of technology and innovation: energy technology, policy and law
- Consumer and environment
- The managerial and industrial engineering aspects of re-use
- Environmental law[1]
- Micro-economics, environmental-economics[1]
- Environmental economics[1]
- Energy and production
- Energy and sustainability
- Fundamentals of systematic low noise design
- Renewable energy sources
- Power engineering for the environment
- Catalysis and environmental technology
- Vehicle technology
- Atmosphere and air pollution
- Solid waste technology
- Exergy, route to sustainable chemical engineering
- Biomass as chemical raw material
- Environmental construction design
- LCA methodology for sustainable construction
- Sustainable building completion
- Practice sustainable building completion

[1] *courses to be followed at the Catholic University of Brabant (KUB)*

Another strong point is that almost the whole certificate program fits in the normal educational courses by effectively making use of the room in the educational programs of the faculties reserved for optional courses. This way the certificate program is an optimal way of sharing knowledge on sustainability that is present at the university, with a minimum of extra time needed for the teaching staff involved.

Evaluation
Every year about 20 students complete the certificate program. A poll among graduates that received the certificate shows that most of them start working in the field of energy and environment (energy, sustainable energy sources, design for environment, cleaner production, environmental policy, cleaning technology, sustainable building, etc.) (Hertogs, 1998). The certificate contributed on profiling as a professional in this field. By following the courses in the certificate program, most of the graduates gained knowledge and understanding on environmental topics and environmental analysis methods that they are still using in their everyday practice on the job.

4. Multimedia Course 'Technology and Sustainability'

The basic course 'Technology and Sustainability', a multimedia course, is the starting point for students that do the certificate program. Starting from case studies based on

practical examples within the own technical specialisation of the student (e.g. the design of a gasification unit for mechanical engineering students) the basics on sustainability (e.g. CO_2 production, climate change) are introduced. This way students experience the direct relation between sustainability issues and the technical specialisation of their interest. The course takes about 80 studyhours. The course itself and the process of making it are described below.[15]

Renewing the course

In the nineties an introductory course on technology and sustainability was given in a traditional set-up using a reader and offering lectures presented by different lecturers. The course was open for students from all faculties. Though this course gave a good overview of the role of technology in a sustainable society, it lacked at one important point. Students did recognise the relationship between environmental problems and technology in general, but most of them did not see how their own technical specialisation and their anticipated professional activities could be of any influence. Therefore the students were mostly not able to apply the knowledge of this course in the practice of their mainstream program.

To reach a greater amount of students within the regular curricula and to appeal to them, it proved of great importance to let them experience the relationship between their specialisation and sustainable development. The idea of a new introductory course was born. For the new course the following objectives were formulated:

- it should have a direct relationship with the technical disciplines and should thus be given shape in close co-operation with the faculties of the TU/e;
- students should get acquainted with methods, that show the environmental effects of choices being made in the design processes;
- they should also learn ways to design products and processes that lead to more sustainable solutions;
- the course has to contribute to the necessary broadening of the curricula to include socio-economic aspects;
- it should function as a starting point for other, more specialised courses in the field of environmental technology and sustainability but should also be able to act as a stand alone course for students for whom this is the only course in environmental technology;
- the project should increase the interest of students for sustainable development; the support for sustainable development by engineers in general and more specific researchers and students of TU/e should be enlarged.

Design of the multimedia course

Based on the objectives given above a start was made designing the new course. The course presentation needed to be very flexible since it has to run for different faculties at different times, and for students with differences in starting level. This is the main reason that the course is presented in an interactive multimedia form. The infrastructural circumstances at TU/e made this choice possible since as a result of new university policy all (new) students are provided with a notebook. This standard notebook with

[15] Text is based on Van Noort, 1999.

standard software simplified the production of the course enormously. The interactive multimedia form gives the opportunity for students to work individually, at their own time and place (home study). It also gives the teachers the opportunity to explain subjects by means of animations, videos and graphics and to present exercises where direct feedback is given to the students. This new way of presenting a course asked for a specific educational concept and user-interface. The learning environment is based on the Web browser Internet Explorer 5.0. Students are able to follow the course via Internet or on CD-ROM.

Those who want to actually see the course or some of the multimedia products (in Dutch) are invited to pay a visit to the website (http://www.tue.nl/tdo/lespakket/). The basic layout of the course has been kept simple, so that it will not distract students from the content. The student chooses his own faculty. From there the student can choose between three options: the study guide, the basic module and the case studies.
The study guide contains general information on the objectives of the course, the structure and overview of the course, specific learning objectives of the case studies, accompanied by a short description per case. The basic module is a more or less encyclopaedial 'book' where all main subjects with regard to sustainable development are described. The basic module is the same for all faculties. The content of the basic module is elaborated in textbox 2. Because most students don't find it comfortable to read large texts from a computer screen, the basic module is also provided as a reader. For each faculty a different set of cases is offered (textbox 3). The case studies consist of subjects in the field of sustainable technology that have been taken from the future professional practise of the students and relate directly to the technical subjects lectured in the faculty. Each of the cases makes reference to particular parts of the basic module.

Textbox 2 Abstract of the basic module (TDO, 2001e)

Part one gives an answer to the questions: What is sustainable development and why has this become so important. Specific attention is given to the role of technology in reaching that sustainable development.

Basic knowledge on the nature and extend of the environmental problems is important in order to understand that it is essential to work on solutions. Therefore **part two** introduces a selection of the major global, regional and local environmental problems.

In **part three** the more technical issues are broadened to the approach that was introduced in part one. A short description is given of the societal issues, like economy, human behaviour and institutional structures, and their role in reaching a sustainable society. These perspectives introduce the preconditions for sustainable technology design. Also the student is made aware of the fact that technology alone cannot bring sustainable development. A change in people's attitude and the way society is developing is crucial. Technology can help to bring about such changes.

Before working on solutions it is important to be able to analyse the situation under consideration. Therefore **part four** discusses a number of analytical instruments: determination of mass and energy flows and balances, exergy analysis, life cycle assessment, net present value calculation and multi criteria analysis. This introduction makes it possible

for students to choose the right method for an analysis and implement it after acquiring some more background information.

Part five is an introduction to design for environment. It introduces a number of directions in which technology should be developed in order to reach more sustainability. Energy saving, recycling and, more general, the closing of the life cycle should have their influence on environmentally friendly designing.

Textbox 3 Subjects of the different cases (TDO, 2001b)

Applied Physics	**Electrical Engineering**
- transport of the future (fuelcells)	- energy savings by induction motor control
- a sustainable district	- biogas cleaning
	- a sustainable district
Mechanical engineering	***Architecture***
- energy from biomass	- building technology
- continuously variable transmission	- Life Cycle Analysis
- polymers	- urban development
- a sustainable district	- a sustainable district
Chemical Engineering and Chemistry	***Technology and Society***
- fine chemicals	- technological transitions
- exergy analysis of PVC gasification	- biomass
	- transport of the future
- polymers	- a sustainable district
- a sustainable district	

Formatted

Content management system

One of the characteristics of designing this course was that a considerable number of lecturers and teaching assistants were involved in making the course to firmly include multidisciplinarity in the course and to guarantee the quality. A steering committee of professors from different faculties, all specialised in sustainable technology, determined the general line of the course and guaranteed the quality by advising on sustainability, environmental and energy related subjects. Several authors were often working on one case study. Communication was therefore essential.

To give authors the opportunity to change their text and to improve communication, the content management system has been developed. The system consists of a central web server with a database, that contains documents: the building blocks for the course. Each contributor who is authorised is allowed to change his part of the course and (for example) add pictures. Therefore special editing facilities are provided. An author can ask a colleague to give comments on the document. These comments are shown to the authors as separate text boxes within the document. Since different persons can use these facilities at the same time, from different places, one could call it a GroupWare-like system.

It sometimes asked a lot of imagination of the lecturers to imagine how their contribution would finally look and work when integrated in the multimedia-learning environment. Also the HTML programming was too difficult or time-consuming for the

lecturers. For that reason a lot of the work on animations and exercises has been done by specialised teaching assistants (existing sorts of exercises and animations) and programmers (new sorts of exercises and animations).

Educational aspects

The choice for an interactive multimedia form invited the integrationof videos, presentations supported by slides, animations and simulations. More didactic added value is attained by frequently presenting exercises with feedback and by integrating worksheets in the learning environment. The worksheets can be partly programmed in advance and offer elegant possibilities for feedback.

A multidisciplinary course based on distance learning asks for specific attention for educational aspects. At the start of designing the course there was very little experience with courses based on distance learning using multimedia, both at the TDO centre and more in general. During the project the lecturers got more experienced on technical and educational possibilities (do's and don'ts). In principle the same functions have to be fulfilled as with a more usual educational form. The educational functions are divided into four groups:

Conditional functions

Motivating the students, linking-up with the starting level and giving insight into learning objectives are the most important conditional functions. A lecturer who is motivated himself usually triggers motivation: he can spread his enthusiasm about the subject and use personal experiences as illustrations. Since in this distance learning course contact is intentionally not built-in, motivation has to be reached in different ways: using many examples, good looking videos and animations, and relevant case studies. The basic module builds on the final level reached in secondary education. The case studies require specific technical knowledge. Inthe study guide and in the text reference is made to the courses, that deal with the specific topics. If felt necessary important notions, calculating methods and formulas are repeated.

Orientation

Orientation involves getting acquainted with the content of the course in terms of knowledge and the ways of thinking introduced (problem solving). In the multimedia course the presentation of knowledge is essentially the same as in many other educational approaches. Giving an overview, presenting examples and discussion of ways for problem solving are here introduced in the form of text and animations.

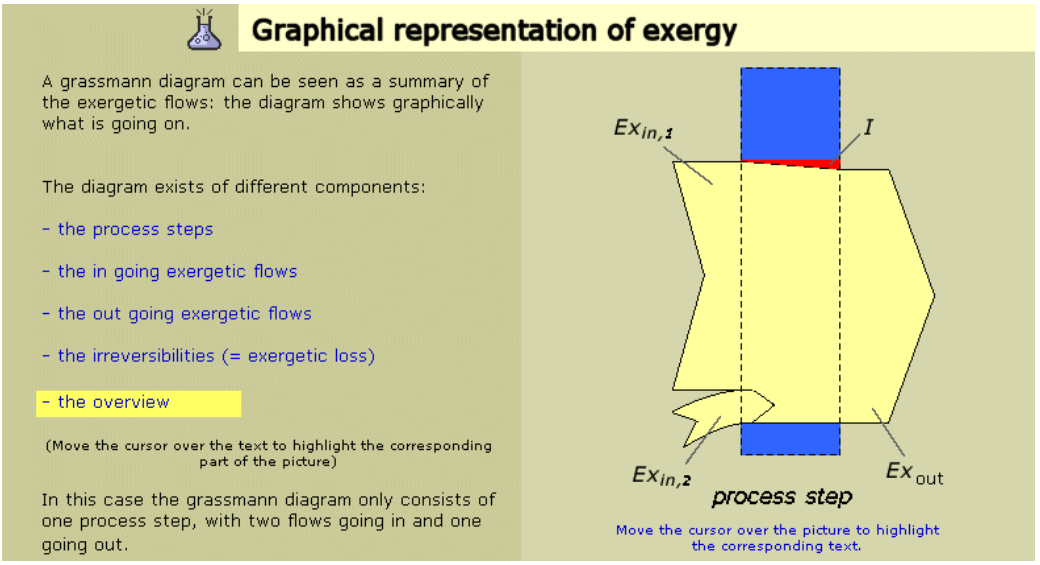
Exercise

Practising by making exercises is essential in making the subject material operational. Feedback on these exercises gives the student the opportunity to find out to what extent he or she masters the topics. A set of exercises usually starts with an easy exercise and builds up to examination level. In the absence of a teacher in this course exercises are offered with an automatic feedback. This integrated feedback proves to give quite some difficulties for the teachers. Exercises have to be formulated extremely carefully since the student is not able to ask for additional explanation. The main challenge is to predict possible mistakes that students will make while doing the exercise and give the proper

feedback. In order to make sure that students will not strand because of inadequate or incomplete feedback an e-mail address has been opened where students can approach lecturers with additional questions and ask for further explanation.

Test and feedback
A final test is necessary to check whether the student meets the educational aims set. Since problems with electronic tests are not yet solved to satisfaction the decision has been taken to use the traditional way of examining. In general the students have to hand in an assignment for one of the cases. The other cases and the basic module are tested in a written exam (in general closed book).

Example of a case
The integration of the basic module with the cases is illustrated using the case "Exergy analysis of the PVC waste gasification process". This case, that was developed for Chemical Engineering and Chemistry students, deals with choosing the most sustainable option for the treatment of PVC waste and the use of exergy analysis for achieving optimal energy efficiency. From the basic module the students acquire knowledge on the waste management scenario used in the Netherlands. This scenario, based on the so-called 'Ladder of Lansink' ranks the order in which waste should be treated: 1. Reuse; 2. Recycling; 3. Back to feedstock; 4. Incineration with energy recovery; and 5. Land filling.
By means of exercises the students can train themselves in making the optimal choice in different circumstances. In the case presented reuse is not possible. Recycling is not an option because PVC is incompatible with other plastics. According to the law combustible waste like plastics, should be incinerated. However, incineration of PVC causes corrosive HCl gas and possibly dioxins. Both are not acceptable in high concentrations in a municipal waste incinerator. A solution for PVC waste is a "back to feedstock" process via gasification. This needs to be assessed by students on energy and exergy efficiency and social and economic feasibility. By studying the process students are confronted with the fact that production inevitably leads to waste and that, without proper action, at the end all elements will come back into the environment. To close the loop of carbon and chlorine a back to feedstock process can be developed. However, also energy is needed to run such a process. Since the use of energy is also related to environmental problems the students are shown how to calculate the exergetic



efficiency, which is a measure for sustainability of a process. Via interactive examples and tasks the students are introduced to the concept of exergy or quality of energy and compounds, see figure 2.

Figure 2 Example of Interactive Exergetic Diagram (TDO, 2001b)

The case teaches students that they are able to redesign processes into more sustainable ones with their knowledge on chemical reactions combined with basic thermodynamics. Several exercises with graphic and calculation interfaces help the students to further master this technique. After optimising the plant the economic feasibility has to be calculated, using the Net Present Value, which is explained in the basic module. Results from the calculation show that under normal economic conditions the gasification process is too expensive when compared to waste incineration, unless environmental impacts are internalised in the economic weighing. An indication is given of how this can be done by governmental interference. It is shown that consumer behaviour can work contra productive to such well intended governmental steering.

Evaluation

The course 'Technology and Sustainability' has become a success. It started in 1998 in one educational program. Now the course is obligatory for students from three educational programs, and optional for students from another three educational programs. The course is followed by up to 500 students each year. The ‘good looks’ and possibilities of multimedia have made many people enthusiastic and willing to co-operate, especially in the start-up period. It makes this impression also on students that follow the course.

Evaluations show that the approach via case studies works and is very much appreciated by the students (TDO, 1998-2001). 15-20 teachers from all faculties are responsible for the cases. It is also a way of involving them in sustainable education and thinking about technology for a sustainable development. The content management system makes it truly possible to work together with this many people on one course.

The fact that students can work at their own time in their own place is also valued. Students miss the contact with teachers. Somehow they are not very eager to use the possibility of sending emails to their teachers. To stimulate the students the CD-ROM now contains a direct link to the email address of the course and a link to the public folders in Outlook. The public folders are used as a forum for students to discuss the content of the course, and for teachers for announcements. On most faculties a few contact hours (self-tuition) are organised, where students can ask their lecturers questions. The contact hours also work as a sort of planning for the students: they can see what they should have studied in which period.

The efforts needed to develop such a course (content management system, basic module, cases, all multimedia) should not be underestimated. It took a lot of work during a period of 3 years. The first presentation of the course was still accompanied by many imperfections. For TU/e it was worth it, because of the large numbers of students following the course and the number of teachers from different faculties who got involved.

5. Multidisciplinary Design Projects

Multidisciplinary Course

The knowledge and insight that students learn in the basic course is built out in the optional courses. One of them is a multidisciplinary design project. As already has been argued in chapter two, sustainability problems are often that broad that a multidisciplinary approach is needed. Sustainable solutions can only be developed by teamwork of specialists from different disciplines and generalists. By carrying out project work the engineers are confronted with the environmental problems and with all aspects of working on solutions. Particularly abilities in dealing with problems, applying expertise and multidisciplinary teamwork will be developed. A team (5-7 persons) consisting of students from at least three different educational programs carries out these kinds of projects. (TDO, 2001d; van Kasteren, 1996)

The problems are purposely formulated so broad that a group first needs to study and analyse the problem to arrive at a working plan, with clearly defined targets and a proper time schedule. Knowledge, insights and skills must be applied and combined with the practice and the socal context of the project. Where there is a lack of knowledge, knowledge has to be acquired through study. The group manages the project within the given time limits. Project education requires a large amount of initiative of the students.

There is also an underlying message in these projects. The environment is not only the field of complainers that see the problems, but much more the field of problem-solvers that work on a better environment – in this case the students themselves. Don't just wait – act!

Usually external principals from (non-)governmental institutions or industry come up with the design challenges that the students take up. In the ideal case, the principal takes part in the project by supplying the group with information concerning the pro ject and by evaluation of the delivered results. Examples of topics that have come up are the design of a solar power driven refrigerator, a zero-energy building and or the recycling of an aluminium ink cylinder of a photocopier.

Guidance

A tutor supervises each group. The tutor regularly visits the group meetings. The time and frequency of these visits are dependent on the phase in which the project is, and on the requirements of the group. The tutor is primarily a process guide and is preferably not be an expert in the field in which the group is studying This is important, because the tutor must not interfere too much with the way in which the project is conducted. An expert always has the tendency to take the lead and to say what to do concerning his field of expertise. This must be prevented, because the initiative must lie (and stay) with the group. The main tasks of the tutor are as follows:

- to adopt a stimulating role within the group;
- to keep an eye on the process;
- to mark the output with respect to the process;

- to highlight study problems of group members;
- to intervene if the principal does not fulfil his role.

The tutor evaluates and judges the group, with a focus on the process in relation to the result. The group determines when the tutor is n eeded. On average, the tutor does not spend more than about 2 hours per week with the group. The tutor helps the group to get started and clarifies his role. The group can consult the tutor over managerial and group aspects. For subject questions, the tuto r can send on experts inside and/or outside university.

Prior to the course the tutors receive a special training (two half-days), within which they learn their roles and tasks, and how to handle situations that are likely to occur. For instance, a group may plan too much work in too short a time, or one of the group members may not fit into the group because of his behaviour.

Project Phases

The project takes 160 study hours (two half days over 20 weeks). Although the project control mainly lies within t he group, the course has been divided into three phases, that have to be finished at a pre-scheduled time. This is done for two reasons. First, every phase is finished with an evaluation of the work carried out. During this evaluation, the necessary feedback can be given, and both the tutor and the experts have the opportunity to make corrections. Secondly, this prevents too much time being consumed by a certain phase, which might endanger the final outcome. The following phases are distinguished: starting phase, developing phase and reporting phase.

The starting phase lasts about 4-5 weeks and must result in a working plan. This plan contains the problem analysis and definition, the targets, the methods of approach, and the project planning. These first weeks are essential to the whole project. This phase is often quite a new experience for most of the students, because they have to translate a problem to measurable and achievable aims. At the beginning of their study, they are used to performing tasks and absorbing knowledge. Now they have to define their own tasks and have to apply the knowledge that they have learnt. This takes quite a lot of time, but the students experience it as a very useful learning method. Before the continuation of the project, the working plan has to be approved by the tutor, the external principal and the expert of the TDO centre.

The working phase lasts from week 5 to week 18. In this phase, the working plan has to be carried out either individually or in subgroups, and must lead to the planned result. Halfway through the course (weeks 10-12), the group has to present its first results and the planning of the remaining time. This is meant as a training in presentations, and as a way of steering the group and checking the progress of the project (such as determining whether or not the targets that were set, can be met).

Finally, in the reporting phase (week 17-20), the group has to integrate all the results into a written report, and present and defend its work before a committee that consists of the tutor, and expert and the principal. It is important to realise that the group is responsible for the result, and every group member has to know which choices have been made and why, as well as knowing the main results. In this phase, it can be

determined whether or not the working plan has been carried out and whether or not the targets have been met.

For the final exam the expert of the TDO centre judges the group work. In his judgement he takes into account the following aspects: problem analysis and definition, methods of approach, depth and broadness of the research, the integration of the knowledge (especially of different disciplines and tasks), the judgement of the principal, the quality of the report, presentation and defence, actions taken after the presentation and the evaluation half way, and the consistency between work done and the time available (the scope of the investigation, the number of students in the group).

Project "Solar powered refrigerator"

In 2000-2001 two multidisciplinary groups worked on the project of the solar powered refrigerator. They made a design, built a prototype and did some testing on a refrigerator powered by solar panels. (TDO, 2001c) With the introduction of photovoltaic energy technologies (PV) it becomes possible to offer sustainable modern energy services to those who live relatively far from a central electricity grid, about 2 billion people. These people live for the major part in developing countries in parts of Africa, Asia and Latin America (in general high temperatures outside). There are two promising and competing cooling systems that can be effectively used for a PV refrigerator: a Stirling cooler and a DC compressor.

One group of students was working at the Technical University of Eindhoven – the Netherlands; the other group of students was working at the National University of Singapore – Singapore. This co-operation gave the whole project much more prestige. Also it made communication a constant issue of attention, with the two groups being geographically separated and culturally different. The Dutch group consisted of 6 students, from the faculties of Applied Physics, Mechanical Engineering, and Chemical Engineering and Chemistry.

Both student teams operated as though they were engineers from a virtual engineering company. This means that the project resembles a real-life situation, in which a contractor issues an order to this engineering office. After a quotation and several mutual agreements, the contractor and the students group agree on a 'contract', which results in the project. A budget is available an all expenses that are made, both real and virtual (wages, rental of offices, etc), have to be documented and periodically reported.

The external principal in this case was Global Cooling B.V. (Zutphen, the Netherlands). This is a company that develops Stirling coolers for various applications. After a thorough literature study, two prototypes were built. The prototype designed by the Eindhoven group uses a Stirling cooler as a cooling device, while the Singapore group has constructed a prototype that uses a DC compressor. Both groups used the same refrigerator and solar panels.

Some of the requirements to the functioning of the refrigerator stated: with respect to cooling down a minimum of 2 litres of water should be cooled down within 24 hours from 43 ^{o}C to 5 ^{o}C; the system should use a thermal storage buffer (the use of a chemical battery is not allowed for environmental reasons); without sunlight the thermal

storage should be able to keep the refrigerator within a 0-8 ^{o}C interval for at least 24 hours.
Combining the technical knowledge of the main parts with the boundary conditions stated by Global Cooling B.V., the coupling of the various individual parts has been realised. The main aspects of the coupling were heat transfer and thermal storage. A thermal buffer, containing 10 kg of water/ice, was calculated and built. The various heat transfer rates involved were investigated in order to identify the critical points in the design. Heat transfer was enhanced by applying a thermal siphon at the hot end of the Stirling cooler and heat fins at its cold head and as the bottom of the buffer container.

Figure 3 The Stirling cooler refrigerator and the group working on it (Photo: T. Adriaans, in TDO, 2001c)

A test protocol has been developed in mutual agreement. These tests are simulating real life situations in terms of available electrical power and requirements with respect to cooling capacity. Testing the two systems has resulted in a systematically higher coefficient of performance (COP) for the Stirling cooler system. However, the thermal inertia of the DC compressor system was lower. Beside the technical design of the system, also a short marketing and cost price analysis has been performed.

For getting this far with the project, the group involved a number of persons and companies. From interested professors for reviewing the testing program and the calculation on heat transport, people from the faculty providing construction and testing facilities, a company that did some welding on the buffer container, to people from companies with an expertise on refrigerators, solar cells or Stirling cooling.
The major goal of the project was the construction and testing of an actual prototype. The fact that by the end of this project a working solar refrigerator was available meeting largely all the expectations, makes this educational goal fully achieved.

Evaluation
Experience has shown that multidisciplinary project work has been an excellent teaching method and addition to engineering education curricula, so improving not only

knowledge but also interdisciplinary thinking and skills. (TDO, 1995-2001) The strong points of the course are 'own responsibility', freedom to define the problem definition, learning aspects of project oriented work, team working, the multidisciplinary character (learning from other disciplines), and the contact with an external principal.
Environmental issues need a multidisciplinary approach, and this course bridges the gap between disciplines, so stimulating interdisciplinary work within engineering education.
Project work is less effective for pure knowledge transfer.
It appeared that 160 hours is really a minimum time for the project to be performed. Nowadays the TDO centre also organises projects of 240 and 320 hours. The period of 20 weeks that the project is running is needed, because the project is completely new for students. They need time to get acquainted with the topic and make a working plan.
Students stress that the reality of the problem that was studied was very motivating. In some cases, it has even been possible to present the results at the principal's office. This close involvement of principals is also very motivating. Also it was concluded that (as expected) projects in the field of design are considered to be the most popular among engineering students.
The TDO centre started with multidisciplinary projects in 1995. This experiment has been so successful that several engineering courses incorporated multidisciplinary projects into their obligatory program. Although there is an effort between these courses to exchange students, the TDO centre is still the only one at TU/e that can ensure that in each group students from at least three faculties are involved.

6. Greening the university

As shown in this article the TU/e offers broad possibilities for students to get acquainted with sustainability. But before a student will take up this task himself, he has to be stimulated. He has to know that the program exists, and that sustainability is an interesting and fun topic, with great possibilities to apply in his future jobs. The TDO centre tries to do so by two ways. The first is spreading information about the educational program. The second is stimulating a 'culture' on the university, were everybody is keen on sustainability.
Spreading information is done in several ways. First of all the basic course and optional courses are followed by more and more students. For them it is a way to get acquainted with sustainability and the certificate program. Also many teachers, student counsellors and deans are aware of the program and stimulate students to follow it. For the multidisciplinary projects posters are spread and students get a personal mailing. Students that have applied for the certificate program, or have given notice that they are interested, are informed by means of a brochure, email and a newsletter that appears three times a year. The TDO centre also organises relevant excursions to companies. These excursions are open for all students.
Creating a culture in which everybody is keen on sustainability is a bit more difficult, because this process cannot really be controlled. On the other hand sustainability is 'hot' and highly appealing. The greening of research and education provides a good basis. Other activities are the stimulation of sustainability in a summer course, in study tours of student societies, inviting well known speakers to our university or organising a game in which groups try to work on a sustainable future for a country (the Stratagem game).

In general the TDO centre just stimulates these activities (by enthusiasm, knowledge or finances). Other parties in the university take the initiative. A good example is the 'nature art' project that is still in the design phase, a project of student society "Johannes Diderik van der Waals" of the faculty of Applied Physics. In the artwork PV cells are attached to floating eggs. The PV cells serve as a sort of sail for the eggs. A special installation will show the total amount of power generated by the PV cells. The student society came with the idea, and is working out the details. The TDO centre provided used but still working PV cells.

Figure 4 'Nature Art' containing solar panels, a project of student society "Johannes Diderik van der Waals" of the faculty of Applied Physics and artist Alex Vermeulen. (TUE, 2002)

As the education is based on the university's own research activities, greening the research is of vital importance for the education on sustainability. Clean chemical processes, biomass, a feasible and affordable but economical car engine, synthetic solar cells, recycling and reuse, new and environmentally friendly materials and methods of house building. The Eindhoven University of Technology carries out research across a broad spectrum of technology that contributes to sustainability. These are not set up as separate projects, but integrated or linked to on-going fundamental and applied research. In many cases the research is multidisciplinary and moves beyond the boundaries of a single faculty. Via the centre TDO, the Executive Board of the university makes means available with which dozens of PhD projects are partially financed. On the other hand, faculties take up research in the field of sustainability of their own accord. And that is as it should be. This stimulates researchers to get involved, researchers that often also give courses. The topics and knowledge are spread in optional courses and the research offers students possibilities for undergraduate research in the framework of environmental research projects.
Every two years the TDO centre publishes all ongoing research on sustainable technology. Goal is to inform our own research community, the students, but also all

kinds of parties outside the university. Also every year a symposium is held on a research topic the TU/e excels in: catalysis, industrial and flexible building, biomass.

7. Results and Conclusions

At the Eindhoven University of Technology the program to integrate sustainability into our curricula includes different levels, starting with a basic course, optional courses among which is a multidisciplinary project and up to the whole certificate program. This makes that both students and teachers can choose to get involved on a level, according to their own commitment and relevancy for their own field of expertise. The program works best in the applied sciences: Chemical Engineering and Chemistry, Mechanical Engineering and Architecture. In more theoretical sciences like Applied Physics and Electrical Engineering there is still work to do.

To get started with the greening of the education there are some important steps to be taken. First of all there is the need for commitment. At TU/e sustainability was introduced in the mission statement. Second there is a need for manpower. The TDO centre holds only a few persons, but it is just enough to get projects started. This is especially true for new courses, because these take more time to organise and develop.

To get started with new courses it is profitable to start courses that are appealing, with a high profile, that are a lot of fun and a good learning experience at the same time. Both the basic course and the multidisciplinary projects fit into this description. By doing so the chances are higher to convince and receive commitment from the decision-makers at the university, the teachers and the students.

The basic course is given at six faculties. The case studies work out well: students are more capable of seeing the relevance of sustainability, and applying the knowledge they gained in their own field of technology. The cases are also a way of involving technical teachers of the different faculties in the education on sustainability. The multidisciplinary projects are found to be very motivating for the student. They learn the students a lot on project work and working in a multidisciplinary context.

The certificate program offers interested students a good way to specialise in sustainability. The certificate is the proof and offers the possibility for students to profile themselves. The program makes sure that students get both a broad and deep insight in sustainability and sustainable technology. Building on the existing optional courses and the master thesis work, the certificate program does not overload the full existing educational programs or the teachers.

To make greening of the curricula work, it is also necessary to do some PR, special activities and to involve the research programs in sustainability issues. The certificate program has given a basis on which there is a continuing effort to green up other courses and to involve more teachers. In 2002 the TDO centre will publish a review of the relationship between mechanical engineering and sustainability in the framework of the DHO21 working group. In September 2002 a new course called ‘Design of Sustainable Technology’ will start. And the TDO centre will be closely involved in setting up a new masters program on energy.

References

1. Bestuurscommissie milieutechnologie TUE (1993), *Rapport bestuurscommissie milieutechnologie TUE* (internal memo in Dutch), Eindhoven University of Technology, Eindhoven.
2. DHO21 (2002), http://www.dho21.nl/
3. Hertogs, K. (1998), Handleidingen, enquête en verwerking van enquête voor TDO alumni (internal memo in Dutch), TDO Eindhoven University of Technology, Eindhoven.
4. Kasteren, J.M.N. van and Deuss, H. (1994), Environmental aspects within engineering education, in: Dellow, B. (Ed.), Proceedings of ENTREE '94, ENvironmental Training in Engineering Education, 1994 November 16-19 Lyngby, pp. 133-138.
5. Kasteren, J.M.N. van (1996), Interdisciplinary Teaching within Engineering Education, European Journal of Engineering Education, Vol 21 No 4, pp.387-392.
6. Noort, D.A.A. van, Schijndel, P.P.A.J. van, Kirkels, A.F., Kasteren, J.M.N. van, Lemmens, A.M.C. (1999), A New Multimedia Course on Sustainable Technology: Integration with Technical Curricula, in: Pöyry, S. and Hagström, A. (Ed.), Proceedings of ENTREE '99, ENvironmental Training in Engineering Education Proceedings, 10-13 November 1999 Tamperre Finland, published by EEE Network, Brussels, Belgium, p. 311-324.
7. RMNO (2000), Duurzame Ontwikkeling in Onderwijs en Onderzoek, RMNO 149, Rijswijk, July 2000
8. TDO (1995-2001), Course evaluations of the multidisciplinary projects (internal memos in Dutch), TDO Eindhoven University of Technology, Eindhoven.
9. TDO (1998-2001), Course evaluations of the basic course 'Technology and Sustainability' (internal memos in Dutch), TDO Eindhoven University of Technology, Eindhoven.
10. TDO (2001a), Brochure certificate program (in Dutch), TDO Eindhoven University of Technology, Eindhoven.
11. TDO, (2001b) CD-ROM for the course 'Technology and Sustainability' (in Dutch), TDO Eindhoven University of Technology, Eindhoven.
12. TDO (2001c), MDPi report by T. Adriaans, B. Bergman, M. Blox, A. Buijsse, R. de Ridder, P. Scholtes, 'The design of a photovoltaic refrigerator', TDO Eindhoven University of Technology, Eindhoven.
13. TDO (2001d), Reader for students that follow a sustainable multidisciplinary project (in Dutch), TDO Eindhoven University of Technology, Eindhoven.
14. TDO (2001e), Reader for the course 'Technology and Sustainability' (in Dutch), TDO Eindhoven University of Technology, Eindhoven.
15. TU/e (2002), http://www.tue.nl/

Personalia

Arjan Kirkels studied Technology and Society at TU/e and graduated in 2000. From 1995 he has worked at the Centre Technology for Sustainability. In 1995 he was responsible for the introduction of the multidisciplinary projects in the regular education programs. The last few years he was involved with the multimedia course: he is co-author of the basic module and several of the casestudies.

Lex Lemmens studied Chemical Engineering at TU/e and in 1987 he received his PhD degree. From 1987 to 1992 he worked as manager of the Technology Development and Advisory Unit in Zambia. From 1992 to 1996 he worked as a senior lecturer at TU/e, in the fields of economic and social feasibility studies and international environmental issues. Since 1996 he has been director of the Centre Technology for Sustainable Development at the TU/e.

Frans Hermans studied Technology and Society at TU/e and graduated in 1998. From 1999 on he has workedat the Centre Technology for Sustainable Development. He has co-ordinated the multidisciplinary projects on sustainable development and was co-author of the basic module, which he also teaches at the faculty of chemical engineering. Currently he is co-ordinating the activities around the certificate program.

Hendry Siepe received his B.Sc. degree in Mechanical Engineering at the HTS in Groningen in 1987, his Master degree in Psychology at the University of Groningen (RUG) in 1994 and his degree of Master of Technological Design at TU/e in 1997. After working in the field of user-system interaction for several years (at Philips and the IPO, centre for User-System Interaction at TU/e), since 2000 he is working at the Centre Technology for Sustainable Development at TU/e, where he co-ordinates multidisciplinary student projects.

Dione van Noort studied Technology and Society at TU/e and graduated in 1995. Therefore she received her bachelor's degree in Chemical Engineering. From 1996 she has been at the Centre Technology for Sustainable Development at TU/e, where she co-ordinated the making of the multimedia basic course 'Technology and Sustainability'.

The Centre Technology for Sustainable Development (TDO) at the Eindhoven University of Technology co-ordinates and stimulates the education and research on sustainable topics – university wide. The Centre is also the intermediate on these topics between the university and society (companies, government, other universities, etc.)

Address:
Eindhoven University of Technology
Centre Technology for Sustainable Development
Paviljoen A.58
P.O. Box 513, 5600 MB Eindhoven
The Netherlands

Phone: +31 40 247 4463
Fax: +31 40 2439475
E-mail: tdo@tue.nl
http://www.tue.nl/tdo/

Return to Contents

19. Re-orienting Education for Sustainability in Universities of Parana-Brazil

Zióle Zanotto Malhadas., José Ederaldo Queiroz Telles. & Paulo Mello Garcias.

Paraná State - Universidade Federal do Paraná - Brazil,

Coordinators of the Committee for Re-orientation
of Education for Sustainability in Paraná State -
Universidade Federal do Paraná - Brazil,
- Email ziolezm@cwb.matrix.com.br

Summary –
The Action Plan 1 for the implementation of Agenda 21 linked to a program for *Re-orientation of Education to Address Sustainability in the universities had a successful*
beginning through the promotion of dynamic seminars in six Universities of Paraná State, where 6.000 issues of the Agenda 21 were delivered to the teachers in order to motivate the insertion of sustainable development strategies in their teaching, researching and extention programs.
Proposals for continuity and spread of the action plans through a Network of universities are presented.

Why the dissemination of the Agenda 21 was considered a priority? It was set as the Action Plan 1 in the Education for Sustainable Development (ESD) Status Report of UFPR- *Universidade Federal do Paraná* - Brazil, presented in the UNITWIN-UNESCO Conference, in Toronto, CA (Oct.2000), because the research developed to identify the ESD status had revealed that there was a big gap between politician speeches and the real situation, as well as between the educational system intentions and the real situation. When "the role of education in the national sustainable development policy" was questioned, we had just to say: " *If we evaluate it according to politician speeches it could be considered a priority, however, there are not incentives or resources directed to research, to didactic materials, to teacher training courses, or new methodologies implementation. There is not economical support or governmental incentive directed to the universities to promote inservice or preservice teacher training for E.E. and S.D."(Malhadas,2000)* And the role of teacher education in the national sustainable development policy has not been explicited yet, except for some brief references to teaching responsibilities in the PRONEA = E.E.National Program.

Interaction is the key word of the Action Plan 1 for the implementation of the **Agenda 21*** recommendations in Brazillian universities. It started with a proposal to develop an interdisciplinary and interinstitucional program to implant new strategies and projects for the Re-orientation of Education for Sustainability in the major universities of the State of Paraná. A committee was installed and a partnership between the Universidade Federal do Paraná (UFPR) and Instituto para o Desenvolvimento Econômico do Paraná (IPARDES) succeeded in opening the doors of several state government institutions in order to re-edit 6.00 issues of the Agenda 21 and organize seminars in the main universities to hand out it to the teachers.

1. Senior professor, UFPR. PhD in Semiotics, International Network Universities UNITWIN-UNESCO
2. Associate professor, UFPR. PhD in Medicine, Pro -rector undergraduate courses
3. Associate professor, UFPR, PhD in Economy, Director of IPARDES.

Most of the teachers that were interviewed to identify the ESD status revealed that they had never seen the Agenda 21. How would we reccommend the insertion of the sustainable development strategies in their teaching programs, if they did not know its concepts and contents ?

Therefore, the main guests of the seminar were the university teachers and the main target was to motivate them *"to develop actions directed to prepare future professionals according to the new socio-environmental ethics, and to facilitate the implementation of the sustainable development in all the constructive actions directed to the improvement of the quality of life and world peace"*.

In May 2001, the first seminar was organized in the UFPR (Universidade Federal do Paraná), and in the sequence, other five similar seminars took place in the major State universities: (1) UEM – Universidade Estadual de Maringá, (2) UNICENTRO = Univerdade Estadual do Centro -Oeste (in Guarapuava city), (3) UEPG – Universidade Estadual de Ponta Grossa, (4) UEL – Universidade Estadual de Londrina, (5) UNIOESTE = Universidade Estadual do Oeste (in Cascavel city)

First a diplomatic approach was planned and a personal letter, followed by a formal invitation was sent to the home address of each teacher from UFPR. They were invited to attend the Seminar for the Re-orientation of Education for Sustainability, when they would receive a gift = an issue of the Agenda 21. About 400 teachers attended the seminar and several others requested their issue of the Agenda 21 a few days later.

The relevance of this initiative could be evaluated by the massive presence of government representatives and academic authorities in the opening ceremony of the first seminar promoted at UFPR, in Curitiba, including the Minister for the Environment (who flew from Brasilia to attend the event), whose lecture was really impressive, introducing some topics of the Brazilian Agenda 21, as well as the magna conference of Dr. Charles Hopkins, UNESCO Chair, coordinator of the International Network of Universities, UNITWIN-UNESCO, who presented the main topics of the international plan for the Re-orientation of Teachers Education to Address Sustainability, offering some academic subsidies based on the Educat ing for a Sustainable Future plan (EPD-UNESCO).

A similar approach was planned in the other universities, which accepted the initial proposal and set a local committee to organize the seminar, with the assistance of the coordinators of the general committee (UFPR + IPARDES), from June to September 2001. About 40% of its teachers attended the seminar in each institution.

The local committees agreed also to adopt the same main objectives, as follows:

(a) to promote the dissemination and implementation of Agenda 21 on the Teaching, Researching and Extention actions in the High Education Institutions of the Paraná State.

(b) To motivate the university teachers to open room in their educational programs in order to prepare their pupils for professional activities with a wider vision of the environmental issues and sustainability.

(c) To foster awareness and to enable the future professionals (of all areas) to colaborate for the environment preservation and the implantation of sustainable development

The program of each seminar was officially opened by the Rector of the university, followed by a magna conference, introducing the objectives, the main target and the Action Plan for the Re-orientation of Education for Sustainability, presented by the Coordinators of the committee (authors of this report), according to the recommendations of the International Network of Universities – UNITWIN-UNESCO. It also included a panel with brief lectures by local teachers, especialists in environmental issues, followed by a debate; and a cultural topic was added with an artistic presentation of folklore.

The starting point was the dissemination of the Agenda 21 among university educators and its insertion in undergraduate curricula, but the main proposal was directed to inservice and preservice teacher training in order to promote a wider multiplication of the concepts and procedures for a new socio-environmental ethics, and to motivate development of environmental preservation and sustainability projects at elementary schools too. Therefore, besides the Agenda 21, each teacher got a complementary booklet, introducing a simplified proposal to facilitate their task to train the future teachers "how" to start an environmental project in the elementary schools, entitled " ***Double Action: Awareness and Environmental Education for Sustainability" (edited by Z.Z.Malhadas)***

The Action Plan for the seminar:

(1) To deliver an issue of the Agenda 21 with the aim to stimulate each teacher/professor and to facilitate his educational task and active participation in the Re-orientation of Education for Sustainability.

(2) To motivate the multiplication of knowledge and the application of strategies to implement the "sustainable development" in all the social segments, to promote awareness among Education professionals mainly in the elementary schools (inservice and preservice training), to facilitate the dissemination of Agenda 21 in the schools. Thus, each universitary educator would receive also a booklet that was organized to facilitate the elementary

school teachers performance: "Double Action: Awareness and Environmental Education for Sustainability" (ZZMalhadas,1998-2001).

(3) To promote the continuity of environmentally correct actions and the interdisciplinary and interinstitutional interactions among the universities directed to sustainable development and to world peace.

Each seminar had local profile and offered an opportunity for the teachers to present their ideas and beliefs, specially those who had already inserted environmental conservation issues in their teaching programs, and/or are developing some projects related to environmental education and sustainable development.

The efforts to organize such events were really gratifying, because there were several opportunities to meet educators who have been devoting their creativity to solve some environmental problems, and were looking for other colleagues to join efforts and develop integrated projects. But, on the other hand, during the preparatory phase, the organizer committee, formed by especialists of the UFPR, with wide experience in studies and researches focusing enviromental issues, had to develop some diplomatic strategies in order to avoid eventual conflicts with some people who behaved as if they were *" the owners of the environment issues"* and tried to set impediments.

In synthesis, the overall goal was reached and the first Action Plan was really successful, as a starting point. Thus, other joint initiatives and projects are being fostered in order to generate an effective process of sustainability in higher education. But they will need some financial support to be implemented. Communications via Internet are taking place among some educators, and a website is being implanted in the IPARDES linked to the universities in order to facilitate the exchange and future partnerships, which will motivate networking. Thus, networking may be a practical alternative, according to Charles Hopkins (1996): *" This networking approach appears to be the most practical initial avenue to pursue in developing education for sustainable development. In attempting to work within this broader framework, it will be important to allow people to see how their individual knowledge can fit within the overarching vision of sustainability".*

The seeding process will have to be incremented as soon as possible to guarantee the harvest of efficient actions towards the sustainability, based on the "fundamentals" quoted by Hans van Weenen (2000;28): *"Concepts, paradigms and systems must be changed by making sustainable development a central objective of all university education, research, management and communication. Education, too, must be sustainable, from sustainable elementary schools through to sustainable universities. The input composition of society's use of resources must be reformulated towards a more sustainable metabolism for industry, organisations and households. The uses of resources that contribute to depletion, high resource use level, pollution and environmental degradation, should be reduced with priority."*

Some proposals for the continuity of this program are presently in discussion at UFPR and among our partners, as follows:

1. Building capacities – Create a new discipline or offer an interdisciplinary modular course on *"Sustainability and Enviromental Preservation"*, available for all undergraduate students at UFPR (where there are 28.250 undergraduate students now), with external support from our partners, utilizing modern teaching/learning methodologies and outdoor activities.

2. Extention - Create a new preservice and inservice trainnig course for Elementary and High School teachers, sponsored by UFPR and the State universities, in partnership with the State Secretary of Education, directed to the development and implementation of new teaching strategies for *re-orienting teachers education for sustainability*, focusing local enviromental impacts and looking for positive solutions to the main problems.

3. Networking - Activate a dynamic network to foster interactions among universities of the State of Paraná and latter southern Brazilian institutions, for the exchange of experiences with project design and interinstitutional programs implementation to promote teaching, research and community activities for the sustainable development.

4. Continuity - Offer support to foster new approaches and dynamic interactions among existent projects in the universities, related to environmental preservation and sustainable development – e.g. the "ProAR" Project = Environmental Education and Air Quality Monitoring

Looking to the future, we visualize, besides these action plans, other opportunities to promote environmental education for sustainability as part of a wider process of social integration inside undergraduate and elementary and high school curricula, and to reinforce the Agenda 21 recommendations among socially committed institutions, like industries, banks, trade bodies and governmental entities, which usually ignore sustainability questions in favour of short-term profit.

Therefore, if we succeed to form some efficient green groups among the University community and society, and among the educators and pupils of Elementary and High School, we will be forming a new generation guided by a solid social-environmental ethics, who will influence the *decision makers* and open the doors to implement an effective process for the sustainable development of Brazil.

.....

Agenda 21* = *Document resulting from international consensus signed by 178 nations during the United Nations Conference - RIO-92 World Summit, Brazil/1992, with 40 chapters devoted to Sustainable Development worldwide implementation.*

.....

References

Hopkins, C. et al. Evolving towards education for sustainable development: An international perspective, Nature & Resources, UNESCO, Paris, p.32/3.

Malhadas, Z.Z. (2000) ESD Status Report of UFPR-Brazil, International Network of Universities, UNITWIN-UNESCO Conference, York Univ., Toronto, CA.

(2001) Double Action: Awareness and Environmental Education for Sustainability (didactic booklet, 2nd.edition), UFPR, Curitiba, Pr., Brazil.

VanWeenen, Hans. Towards a vision of a sustainable university. In Sustainability in Higher Education (international journal), vol.1, number 1, 2000, p.28

Biography

* - Zióle Zanotto Malhadas is Senior professor, PhD in Semiotics, coordinator of the Program "Re-orientation of Education for Sustainability" and the "ProAR Project: Environmental Education and Air Quality Monitoring" in the Universidade Federal do Paraná (UFPR)- Curitiba, Paraná, Brazil. She is a co-founder of the Doctoral Program of Environmental Studies and Sustainable Development - UFPR; member of TEC (Teacher Education Consultancy) of UNESCO, co-founder of the International Network of Universities UNITWIN-UNESCO for Re-orienting Teachers Education to Address Sustainability, member of the International Commission of the NAAEE - North American Association for Environmental Education. Researcher, lecturer and Author of didactic books and teaching materials for Environmental Education for Sustainability.

* - José Ederaldo Queiroz Telles - Assistant Professor, PhD in Medicine, ex-Coordinator of the Medicine Undergraduate Course, Vice-Rector for Graduation Courses of the Universidade Federal do Paraná.

* - Paulo Mello Garcias - Assistant Professor, PhD in Economics, former Coordinator of Economics courses in the Universidade Federal do Paraná and Director of IPARDES = Instituto para o Desenvolvimento Economico do Paraná, Brazil.

Return to Contents

20. Environmental Management Accounting as a decision making tool towards the implementation of an EMS.

Maryna Möhr-Swart,

Technikon Pretoria, South Africa

1. Introduction

Ecology versus Economy

During the fourteenth and fifteenth centuries huge changes or shifts occurred regarding the worldview. The Ptolemaic model indicated that the earth was the centre of the universe and that the sun revolved around the earth. Nicolaus Copernicus challenged this model, indicating that the earth revolved around the sun. His model led to total shift in the worldview – a revolutionary way of thinking started because of one man's mind shift.

According to Brown (2001:3), we need a similar shift in our worldview; in terms of how we think about the relationship between the earth and the economy. The issue now is whether the environment is part of the economy or the economy is part of the environment.

Financial specialists, the economists and accountants, see the environment as a subset of the economy. Unfortunately, financial theories and economic indicators do not explain how the economy influences the earth's degradation, why the Arctic Sea is melting or why grasslands are turning into desserts. Yet Brown (2001:4) also stated that economics are essential for measuring the cost to society of these excesses. Current trends also indicate that the economy and the earth's natural systems are in conflict.

Ecologists, on the other hand, see the economy as a subset of the environment. Ecologists and environmentalists understand the complexity of the earth's natural systems and that the earth is one giant ecosystem, made up of an uncountable number of smaller ecosystems; each consisting of natural resources including living things like human beings. These ecosystems are all interrelated and dependent on each other.

Elkington (1998:24) states in his book *Cannibals with forks* that capitalism and sustainability do not make easy bedfellows. One thing we must remember is the saying by Sir John Clapham: "Economic advance is not the same thing as human progress". Economic growth (or advance) is traditionally defined as the annual rate of increase in total production or income in the economy (Mohr, Fourie et al., 1995: 643). An increase in production means an increase in the utilisation of our natural resources. This, again, may result in diminishing resources.

"Ecologists understand that all economic activity, indeed all life, depends on the earth's ecosystem – the complex of individual species living together, interacting with each other and their physical habitat ... Economists [and accountants] know how to translate

goals into policy. Economists and ecologists working together can design and build an eco-economy, one that sustains progress" (Brown, 2001:4).

This mind shift is essential when looking at tertiary educational institutions (technikons, universities and colleges), since their main function is preparing students to be future leaders. These institutions also consist of more than lecture rooms; they consist of people, hostels, laboratories, gardens, maintenance departments, etc. All of these utilise natural resources and produce waste.

Sustainable development

Sustainability, according to Elkington (1998:20), is the principle of ensuring that our actions today do not limit the range of economic, social, and environmental options open to future generations. Governments, business leaders and academia propose sustainable development as a solution for a wide range of problems. Supporting sustainable development and economic growth are environmentally sound technologies (EST). According to the publication *Sustainable business: economic development and environmentally sound technologies* by the Regency Corporation Limited & United Nations Environmental Programme (1998:21) these technologies are used to reduce and clean up pollution, cut down on the use of energy and other material resources, and prevent pollution and waste through cleaner production and recycling. There are five ways to ensure sustainable development:

- Through simple operating and housekeeping processes
- Redesigning and/or reformulating products
- Modifying processes
- Changing plant/laboratory equipment
- Substituting less harmful raw materials

These measures ensure low environmental impacts, resource efficiency and economic and social advantages. Implementing these measures would initially have a cost implication, but the long-term net result would be positive. Sustainable development must form part of any tertiary educational institution's core values and educational programmes.

Triple bottom line

Elkington (1998:73) explains that the triple bottom line concept stresses the relationship between the following:

- Social bottom line
- Economic bottom line
- Environmental bottom line

These three bottom lines are not stable; they are in constant flux, due to social, political, economic and environmental pressures, cycles and conflicts. Governments, businesses and educational institutions using the triple bottom line and sustainable development as basis can plan strategically and be managed in a way that ensures environmental efficiency and effectiveness while still making a profit.

According to Hawken, Lovins and Lovins (2000:4), an economy needs four types of capital to function:

- Human capital, in the form of labour and intelligence, culture, and organisation

- Financial capital, consisting of cash, investments, and monetary instruments
- Manufactured capital, including infrastructure, machines, tools, and factories
- Natural capital, made up of resources, living systems, and ecosystem services

The normal industrial system uses the first three forms of capital to transform natural capital into products for daily use. A transformation of industry, education and training as well as commerce is necessary, since the human population will double during the next century and the resources available per person will drop by one half to three-fourths. This transformation, or changes done properly, could promote economic efficiency, ecological conservation and social equity– the triple bottom line.

Tertiary educational institutions (technikons, universities and colleges) are being managed as business units, and the triple bottom line concept must therefore also apply.

2. Environmental management systems

Companies in every industrialised country are adopting environmental management systems to manage with greater efficiency and systematic approach problems and opportunities in the environmental field. The environmental management system has a central role to play, not only as managerial instrument of environmental and safety complexity inside and outside the activities of a company, but also as way to change the environmental constraints in business opportunities, to reduce the costs and to save resources, and be competitive.

More factors drive companies in the direction of the environmental management systems:

- The costs and the environmental responsibilities.
- The competition.
- The evaluation of the environmental engagement on behalf of shareholders.
- The national and community regulations.

It is important to understand what the environment really means. According to ISO 14001 (1996), environment can be defined as the surroundings (surroundings in this context extend from within an organisation to the global system) in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.

NEMA (1998) defines the environment as the natural environment and the physical chemical, aesthetic and cultural properties of it that influence human health and well-being.

It is therefore clear that environmental management systems are not only applicable to traditional businesses and commerce, but also to tertiary educational institutions.

3. Environmental management accounting overview

The way to create an understanding of environmental issues among managers and operators is by relating environment to the economy of a company. Environmental accounting, as a management tool, could improve business decision-making in recognition of the increasing environmental challenges and opportunities facing companies. It does this by identifying hidden or misallocated internal and external

environmental costs and allocating them to particular products or services. Environmental accounting could also serve as a solid foundation for an environmental management system, or increase the effectiveness of an existing one.

EMA definition

The International Website for Environmental Management Accounting (EMA) explains that EMA can be defined as the identification, collection, estimation, analysis, internal reporting and use of materials and energy flow information, environmental cost information and other cost information for both conventional and environmental decision-making within an organisation. The following key points should be noted:

- EMA focuses on costs internal to the company.
- EMA places particular emphasis on accounting for environmental costs.
- EMA encompasses not only environmental and other cost information, but also information on physical flows of materials and energy.
- EMA information can be used for most types of management activities within an organisation.

EMA therefore incorporates and integrates two of the three building blocks of sustainable development or the triple bottom line concept – environment and economics – as they relate to an organisation's internal decision-making. The third building block, the social bottom line, can be added on after the EMA has been completed and the end result will then have incorporated all three building blocks.

Benefits and uses of EMA

An organisation's decision-makers can use the physical flow information and cost information provided by EMA to make decisions that impact both the environmental and financial performance of the organisation. It is important to note that, while EMA supports internal decision-making, the implementation of EMA does not guarantee any particular level of environmental or financial performance. However, for organisations and programmes that have the goals of minimising costs, especially environmental costs, and minimising environmental impacts, EMA provides an essential set of information for meeting those goals.

EMA data are particularly valuable for management initiatives with a specific environmental focus. EMA provides not only the cost data necessary for assessing the financial impact of these management activities, but also the physical flow information (e.g., raw materials use and waste generation rates) that helps characterise environmental impacts. Examples of the many environmental initiatives that benefit from EMA are:

- Environmental management systems
- Pollution prevention
- Design for environment
- Environmental life cycle assessment/costing/design
- Environmental supply chain management
- Environmentally preferable purchasing
- Extended producer/product responsibility
- Environmental performance evaluation and benchmarking
- Environmental performance reporting

Thus, EMA is not merely one environmental management tool among many - rather, EMA is a broad set of principles and approaches that provides the materials/energy flow and cost data critical to the success of many other environmental management activities.

According to the United Nations Division for Sustainable Development (2001:9), the application fields for the use of EMA data are:

- Assessment of annual environmental costs/expenditure
- Product pricing
- Budgeting
- Investment appraisal, calculating investment options
- Calculating costs, savings and benefits of environmental projects
- Design and implementation of environmental management systems
- Environmental performance evaluation, indicators and benchmarking
- Setting quantified performance targets
- Cleaner production, pollution prevention, supply chain management and design for environment projects
- External disclosure of environmental expenditures, investments and liabilities
- External environmental or sustainability reporting
- Other reporting of environmental data to statistical agencies and local authorities

1.1 Potential benefits of EMA to tertiary educational institutions

- The ability more accurately to track and manage the use and flows of energy and materials, including pollution/waste volumes, types, and fate.
- The ability more accurately to identify, estimate, allocate, and manage/reduce costs, particularly environmental types of costs.
- More accurate and comprehensive information to support the establishment of and participation in voluntary, cost-effective programmes to improve environmental performance.
- More accurate and comprehensive information for the measurement and reporting of environmental performance, thus improving company image with stakeholders such as customers, local communities, employees, government, and finance providers.

(Benefits adapted from the International Website for Environmental Management Accounting (EMA))

1.2 Need for EMA

"The need for EMA was conceived in recognition of some of the limitations of conventional management accounting approaches for management activities and decisions involving significant environmental costs and/or significant environmental consequences/impacts. For example, the following conventional management accounting practices might contribute to the inadequate consideration of environmental costs in internal decision-making:

- The unintentional 'hiding' of many environmental costs in overhead accounts
- Inaccurate allocation of environmental costs from overhead accounts back to processes, products, and process lines

- Inaccurate characterisation of environmental costs as 'fixed' when they may actually be variable (or vice versa)
- Inaccurate accounting for volumes (and thus costs) of wasted raw materials
- The actual lack of inclusion of relevant and significant environmental costs in the accounting records at all." International Website for Environmental Management Accounting (EMA).

As more tertiary educational institutions come to recognise that many management decisions have potential environmental impacts and costs of various kinds, recognition of the value of EMA will grow. In the end, the distinction between conventional management accounting and EMA may blur, as the two approaches merge into a single broad management accounting approach that can better inform all decisions, environmental and otherwise.

4. Activity-based cost and environmental management

Activity-based costing can defined as "a methodology that measures the cost and performance of activities, resources and cost objects. Resources are assigned to activities, then activities are assigned to cost objects, based on their use … [A cost object] is any customer, service, organisation, project, flux or product for which separate cost/revenue assessments are needed" (Emblemsv◇g & Bras, 2001:17[glossary]). The aim of using ABC is to achieve sustainable development. Assessing both the economic and the environmental impacts of the products and processes, to improve the products and processes and identify the economic and environmental win-win situation, can accomplish this.

The ABC model specifies that what we measure must be comparable, not open to subjective influences at the practitioner level, be easily measured and complement money. With this in mind, the activity-based cost and environmental management approach is built with the following three dimensions:

- Cost, which captures the costs from the economic perspective
- Energy consumption costs
- Waste generation costs

The ABC model consists of the following ten steps, according to Emblemsv◇g & Bras (2001:107):

- Step 1: Identify the assessment objects
- Step 2: Create an activity hierarchy and network
- Step 3: Identify and quantify the resources
- Step 4: Identify and quantify the resource drivers and activity drivers and their intensities
- Step 5: Identify the relationship between activity drivers and design changes
- Step 6: Model the uncertainty
- Step 7: Find/compute the cost, energy consumption and waste generation of the activities
- Step 8: Find/compute the cost, energy consumption and waste generation of the objects
- Step 9: Perform sensitivity and other numerical analyses

- Step 10: Interpret the results and iterate if necessary

ABC is an alternative way of using life-cycle assessment and sustainability indicators to obtain information regarding environmental impacts, costs and expenditures for EMA. It is a very detailed process, but will give extremely important information.

5. Total cost assessment

"Total cost assessment (TCA) is a … concept that seeks to provide a process for quantifying all environmental and health costs, both internal and external, associated with business decisions …. [TCA is] the identification, analysis, and use of environmental and human health cost information associated with a business decision" (Little, 1999:5). Although it is designed to assist in internal decision-making, it differs from EMA in that not only internal costs, but all potential environmental and health costs should be fully considered.

The TCA process consists of the following steps, according to Little (1999:3-4):

- Step 1: Project definition, goal setting and scoping
- Step 2: Streamline the analysis (including the life-cycle analysis)
- Step 3: Identify potential risks
- Step 4: Conduct total cost inventory
- Step 5: Conduct impact assessment
- Step 6: Document results
- Step 7: Feedback to company's main decision loop

It is clear that TCA can also be used as a source of information when conducting EMA.

6. Environmental costs

Environmental costs are not always as clear-cut as conventional costs. From a macroeconomic perspective, the price of scarce raw materials, pollution and disposal does not reflect their true value and cost to society. Health hazards, reclamation of contaminated sites, etc. are environmental costs usually not borne by the polluter, but by the general public.

Environmental costs comprise both internal and external costs and relate to all costs occurred in relation to environmental damage and protection. Different models or methods use different definitions or interpretations of environmental costs.

ABC uses the traditional fixed costs, variable costs and overhead costs to determine the total activity costs. These activity costs can then be divided into normal operating costs and environmental costs by means of a life-cycle assessment.

"Activity-based costing improves internal company cost calculation by allocating costs typically found in overhead costs to the polluting activities and products. Significant material flows are traced throughout the company and their costs are allocated back to the polluting cost centers" (Regency Corporation Limited & United Nations Environmental Programme, 1998:14).

TCA is more clear in describing the environmental costs, and Little (1999:1-12) lists the environmental and health costs as follows:

- Type I: Direct costs for the manufacturing site (Direct costs of capital investment, labour, raw material and waste disposal. May include both recurring and non-recurring costs. Includes both capital and operations and management costs.)
- Type II: Potentially hidden corporate and manufacturing site overhead costs (Indirect costs not allocated to the product or process. May include both recurring and non-recurring costs. Includes both capital and operations and management costs. May include outsourced services.)
- Type III: Future and contingent liability costs. (Liability costs include fines and penalties caused by non-compliance and future liabilities for forced clean-up, personal injury and property costs damage.)
- Type IV: Internal intangible costs. (These are costs that are paid by the company. Includes difficult to measure cost entities, including consumer acceptance, customer loyalty, worker morale, worker wellness, union relations, corporate image, community relations and estimates of avoided costs — fines, capital, etc.)
- Type V: External costs. (Costs for which the company does not pay directly. These costs are borne by society and include deterioration of the environment by pollutant dispersions that are currently in compliance with applicable regulations.)

TCA further describes the costs as the following:

- External (or societal) costs. These are costs that are incurred as a result of a company affecting the environment or human health, but for which the company is not immediately held legally or fiscally responsible. These "externalities" include environmental degradation and adverse effects on humans, property, and welfare associated with emissions/activities that are performed in compliance with regulatory requirements.
- Company costs that are typically considered in conventional decision-making
- Private costs that include internal intangible costs plus other environmental and health costs that are potentially overlooked in decision-making, including regulatory, voluntary, up-front, operational, back-end, overhead, future, contingent and image/relationship costs.

According to the principles stated by the Regency Corporation Limited & United Nations Environmental Programme (1998:11-14) environmental costs and Regency Corporation Limited & United Nations Environmental Programme (1998:11-14), expenditure can also be defined as the following:

- Environmental protection costs, including costs for prevention, disposal, planning, control, shifting actions and damage repair that can occur at companies and affect governments or people.
- Life-cycle costing cuts across the accounting boundaries of the company, as well as the normal time horizon of accounting, which causes substantial methodological and practical problems. In theory, in competitive markets, the material purchase price is expected to reflect the costs that have been incurred up to the point of sale, in any case.

- Corporate environmental costs are costs incurred to deal with contaminated sites. Effluent control technologies and waste disposal may first come to mind.
- Corporate environmental protection expenditure includes all expenditure for measures for environmental protection of a company, or on its behalf, to prevent, reduce, control and document environmental aspects, impacts and hazards, as well as disposal, treatment, sanitation and clean-up expenditure. The amount of corporate environmental protection expenditure is not directly related to the environmental performance of a company.

For internal company calculation of environmental costs, expenditure for environmental protection is only one side of the coin. The costs of waste and emissions include much more than the respective pollution prevention or treatment facilities.

The concept of waste or non-product has a double meaning. Waste is a material which has been purchased and paid for, but which has not been turned into a marketable product and is directly linked to inefficient production. Thus, the costs of wasted materials, capital and labour have to be added to arrive at total corporate environmental costs. Waste in this context is used as a general term for solid waste, waste water and air emissions, and thus comprises all non-product output. Materials include water and energy.

> Environmental protection costs (emission treatment and pollution prevention)
> \+ Cost of wasted material
> \+ Cost of wasted capital and labour
> = Total corporate environmental costs
> (Regency Corporation Limited & United Nations Environmental Programme (1998:12.)

Material flows are money flows and can therefore be partly traced by conventional accounting systems. The main problem associated with the traditional cost-accounting systems is that the non-product output (waste, wastewater, etc.) is not quantified and monetarised separately in accounting systems.

Some methods have been developed to overcome these problems. Residual waste accounting and flow cost accounting have addressed this problem and not only measure the costs of waste according to its disposal costs, but also add the material purchase values and pro rata production costs. It also not only separates the costs of environmental protection, but also detects all material flows via the company's cost centres and reassesses production costs.

"Different companies might define environmental costs differently and use a variety of methods for cost assessment. Often, the distinction between health and safety and risk management poses questions. For the purpose of internal management, focus should not be so much on the definition, as long as all significant and relevant costs are included in decision-making" (Regency Corporation Limited & United Nations Environmental Programme, 1998:14).

The rest of this report only deals with corporate environmental costs. External costs that result from corporate activities, but are not internalised via regulations and prices are not considered. It is the role of governments to apply political instruments such as emission control regulations in order to enforce the "polluter-pays" principle and thus to integrate external costs into corporate calculations.

7. Environmental management accounting methodology

The EMA methodology that will be discussed has been adapted from the methodology as discussed by United Nations Division for Sustainable Development (2001:17-32).

In the methodology presented in this report, the environmental cost scheme is first used for the assessment of annual corporate environmental expenditure of the previous year. A breakdown of cost centres and processes can be done accordingly.
The focus of EMA is not on disclosure of annual environmental costs, but on further internal calculation; annual expenditure is the first step in a top-down approach to environmental cost management. Annual expenses are the best available data source; a further distinction into cost centres, processes, products and material flow balances should be done in a step-by-step procedure, gradually improving the information system.

The environmental cost/expenditure categories follow the historic development of awareness for environmental cost categories. The five main categories are:

- Waste disposal and emission treatment costs. (Including related labour and maintenance materials. Insurance and provisions for environmental liabilities are also treatment instead of prevention, as are environmental costs comprising treatment, disposal and clean-up costs of existing waste and emissions.)
- Prevention and environmental management. (Labour costs and external services for good housekeeping as well as the "environmental" share and extra costs of cleaner technologies and green purchase are included. Research and development for environmental projects are part of pollution prevention.)
- Wasted material (non-product) purchase value. (Wasted materials are evaluated with their material purchase value or materials consumed value in the case of stock management.)
- Production costs of non-product output. (Production cost which include labour hours, depreciation of machinery and operating materials and financing costs. In activity-based costing and flow-cost accounting, the flows of residual materials are more precisely determined and allocated to cost centres.)
- Environmental revenues derived from sales of waste, grants or subsidies are accounted for separately.

It is important to remember that costs that are incurred outside the company and borne by the general public (external costs) or that are relevant to suppliers and consumers (life-cycle costs) are not dealt with.

Environmental expenditure/costs and revenue/earnings

Env Media / Env costs/expenditure categories	Air/ Climate / Waste water	Waste	Soil / Groundwater	Noise / Vibration	Biodiversity / Landscape	Radiation	Health & Safety	Other	TOTAL
1 **Waste and emission treatment**									
1.1 Depreciation of related waste treatment equipment 1.2 Maintenance and operating materials and services for waste treatment 1.3 Related personnel eg waste sorting 1.4 Fees, taxes, charges									
1.5 Fines and penalties									
1.6 Insurance for env liabilities									
1.7 Provision for clean up costs									
2 **Prevention and environmental management**									
2.1 External services for environmental management eg auditors, env consultants									
2.2 Personnel for general environmental management activities									
2.3 Research and development, (environmental specific) 2.4 Other environmental management costs eg awareness and training of staff, env reports and publications									
3 **Material purchase value of non-product output**									
3.1 Raw materials									
3.2 Packaging									
3.3 Auxiliary materials eg oil for vehicles									
3.4 Operating costs									
3.5 Energy (electricity, gas, steam)									
3.6 Water									
4 **Processing costs of non-product output**									
4.1 Processing of waste materials on site									
3 **Environmental expenditure**									
5 **Environmental revenues**									
5.1 Donations, awards 5.2 Other earnings, eg paper recycling									
3 **Environmental revenues**									

Table I: Adapted fromUNITED NATIONS DIVISION FOR SUSTAINABLE DEVELOPMENT. 2001. *Environmental management accounting: procedures and principles.* New York.

The next part of the paper provides information on the different expenditure items or cost categories. The fact that technikons and universities normally consist of a variety of working units, e.g., hostels, cafeterias, administration buildings, lecture halls and

laboratories, makes the EMA application more difficult. It is suggested that a matrix t be drawn up for each grouping of working units.

Waste and emission treatment
Waste and emission treatment costs dealing with the non-product output of the institution should be addressed. Waste collection, recycling and disposal costs are the most obvious costs that should be monitored.

Depreciation for related equipment
The most obvious assets in this section are refuse compactors, collection containers and vehicles, waste heat recovery systems, air pollution filters, noise abatement investments, sewage treatment plants, etc. The land/soil category may also include areas such as landscape protection, re-cultivation and repair of contaminated sites. Most universities and technikons outsource waste compaction, etc., and this should be dealt with under the heading *External services for environmental management.*

Maintenance and operating material and services
The relevant environment-specific investments and equipment should be defined, to be able to calculate the annual costs for related operating materials and equipment, maintenance, inspection, etc. Again, technikons and universities seldom need specialist maintenance for pollution p revention equipment.

Related personnel
The time spent handling waste and emission-related investments is calculated here. This section mainly applies to the personnel of waste collection departments, and the people dealing directly with the identified waste and emissions streams and equipment. If this function is contracted out it must be dealt with under the heading *External services for environmental management.*

Fees, taxes, charges
All disposal, sewer access and effluent fees, but also costs for specific licenses, or environmental taxes, if applicable, should be quoted here. Taxes and charges can be levied on waste volumes, wastewater and air emissions and should also be quoted.

Fines and penalties
In cases of severe non-compliance, fines and penalties may be charged.

Insurance for environmental liability
Institutions can cover themselves against liability risks by way of insurance. The annual contributions to insurance against traditional damage to persons, goods and biodiversity caused by dangerous and potentially dangerous activities should be quoted here. Insurance covering higher risks of fire or other damage to the laboratories or to transport due to dealing with hazardous substances and dangerous processes should also be quoted here. Health and safety issues should be added to the matrix in a separate column, especially for accidents that may occur in laboratories or when moving chemicals from one place to another.

Institutions often lack the resources needed to implement risk management systems that are as effective as those of larger industries. When they cause damage, they are also less likely to have the financial resources to pay for redressing the damage. The availability of insurance availability reduces the risks institutions are exposed to.

Provisions for clean-up costs, remediation, etc.

Provisions are a classic instrument for anchoring an institution's risk protection scheme in the balance sheet, and should be formed for contingent liabilities and potential losses. The function of provisions is to consider and anticipate future expenditure and obligations and to help the institution protect itself against contingent risks.

Examples of (contingent) liabilities that may emerge from a company's activities are:

- Groundwater contamination (e.g., from working with solvent-containing substances)
- Surface water contamination (e.g., from spills and transport damage)
- Soil contamination (e.g., from contaminated surface water through a lack of protection troughs and collection tanks)

Prevention and environmental management

In contrast to the first block, which deals with emission treatment, this section deals with prevention costs and costs for general environmental management activities. Generally, institutions do not have an environmental management department specifically for the management of the environmental issues related to the normal operations of the institution. It is usually part of the building and landscape department or the logistics department. The environmental costs and expenditure should therefore be calculated as a percentage of the total costs. Some institutions offer environmental educational programmes and the academic staff would then also manage the environmental issues of the institution. Again, the costs should be calculated as a percentage of the total costs of the academic department.

External services for environmental management

All external services for environment-related consultants, inspections, audits and communication should be quoted here and, as far as possible, allocated to the relevant environmental media. In general, though, the amounts will be assigned to the column of "other expenses", since they basically cover the entire sum of company activities. It is imperative not to overestimate the environmental part of these services.

The costs for printing the environmental report and other communication-related activities like eco-sponsoring should also be summarised under this heading. The related expenses will probably not have been systematically collected on one account or cost centre, but spread throughout the institution and across accounts. A meeting with the environmental team regarding the previous year's projects and activities would ensure that all relevant expenditure be traced back and the allocation to expenditure items and cost centres be improved.

Staff for general environmental management activities

This section includes internal staff for general environmental management activities, not directly related to emission treatment or the production of non-product output or waste.

It should be stressed again that academic staff may be involved and the costs should be calculated as such.

Research and development

External contracts and internal staff hours for environment-related research and development projects should be quoted separately from general environmental management activities. General academic research projects regarding environmental issues (not relating to the institution's environmental performance) should not be quoted here. Only if the main purpose of a project is to upgrade the environmental performance of the institution should the staff hours and related expenses be quoted under environment.

Extra expenditure for cleaner technologies

Cleaner technologies allow for more efficient production processes, which reduce or prevent emission at the source. Often, the new technology also uses less energy, is faster and has more operational capacity. Most pollution prevention investments involve a share of environmental improvement and a share of improved production, with the respective shares to be estimated.

If the cleaner technology represents the current state of the art and was installed mainly as a regular replacement of an old device, it should not be regarded as environmental investment. An example would be the installation of a more efficient and effective system controlling light switches.

Other environmental management costs

Various costs related to environmental protection, e.g., extra costs for ecological procurement, could be quoted here. Other environmental management activities like eco-sponsoring are also to be found in this category. A major portion of the costs in this category will most likely be related to external communication, such as the publication of an environmental report. It should be stressed here that care should be taken not to document a cost item twice.

Material purchase value

Whatever has not left the institution as a product is a sign of inefficient operations and must, by definition, be waste and emissions. Determining the material flows for, at least, raw materials and auxiliary materials is therefore imperative for environmental cost assessment. The material purchase cost of wasted materials is the most important environmental cost factor, accounting for 40 to 90 per cent of total environmental costs, depending on the value of raw materials and the labour intensity. This section, however, is also very difficult to assess for an educational institution. The factor that should be remembered is that the main products of the institution are the graduating students.

Before waste and emissions occur, the materials concerned have been–

- purchased (materials purchase value);
- transported, handled and stocked (costs for stock management, handling and

transport);
- processed in various operational steps (equipment depreciation, work time, auxiliary and operating materials, costs for finance, etc.);
- collected as scrap, waste, etc., sorted, transported, treated, stocked; and finally,
- disposed of (disposal fees).

Institutions thus pay three times for non-product output (waste):
- At purchase;
- During operations; and
- At disposal.

This section addresses the first and major part of these costs, namely, wasted materials. The next section addresses handling and processing costs, and other wasted capital and labour costs.

Raw materials
Non-product raw material output will mostly be disposed of as solid waste or as wastewater. Water and materials balances will be helpful to determine the waste component.

Auxiliary materials
These materials become part of the product, but are not its main components. Often, they are not monitored separately.

Packaging
The material purchase value of wasted product packaging should be estimated. Packaging for purchased materials is included in the material price and cannot be found in purchase records. If it cannot be returned to the suppliers it ends up as waste and will have to be disposed of at high costs.

Operating materials
Operating materials are, by definition, not contained in the "product". Some materials are built into the office building, and stationery will have left the company via mail, but the major part of chemicals, solvents, detergents, paint, glue, etc. goes to non-product output. It may be necessary to separate operating materials used for administrative purposes.

Energy
For energy input, the proportion of non-efficient use has to be estimated.

Water
All materials that can be found in wastewater are summarised here. In addition, the purchase cost of water input is attributed to this column.

Processing costs
The non-product output (waste) not only has material purchase value – it has also undergone processing in the institution before leaving it again. Thus, wasted labour and

capital costs should be added. Work time lost due to inefficient operations and a share of depreciation for machinery as well as possible other costs should be accounted for under this item.

Environmental revenues
These include only actual earnings from recycled materials or subsidies and can occur in all columns (savings are treated separately).

Subsidies, awards or donations
Subsidies should be quoted here, as they mean actual income. Institutions sometimes receive external awards for their activities. When the prize is real money and not a symbol, the revenue should also be quoted. Donations should also be quoted.

Other earnings
This section should include earnings from selling recyclable wastes or other possible earnings that could derive from waste, for example, sharing the capacity of a wastewater treatment plant.

8. Using EMA as a decision-making tool towards the implementation of an EMS

With the discussion of EMA and the purpose of EMA (to be able to quantify all environmental costs and expenditures in relation to the total income and expenditure of the institution) in mind, it is not difficult to recognise the value of EMA as a decision-making tool towards the implementation of an environmental management system (EMS).

According to Parker (1998:183), it is clear that there is no objective way to evaluate a company's entire environmental performance in the form of indicators (costs). He also indicates that the lack of clear (environmental) goals is one of the obstacles to environmental performance measurement. The process of identifying and analysing environmental costs, both hidden and clearly stated, is necessary to determine the effectiveness of an institution's total performance and then link these costs to the existing accounting system. When cost information is used as the environmental data, the result is a percentage, which gives the value meaning in itself.

Management at educational institutions will realise that, although they do not manage high-impact production companies, every institution has environmental costs that will impact on their budgets. If they understand this, motivation to implement an environmental management system (EMS) is much easier and understandable.

To summarise, the benefits of EMA and EMS can be listed as the following (adapted form Global Environmental Management Initiative, 1999:4-7):

- Increased level of pollution prevention
- Reduced releases of regulated and non-regulated pollutants
- Decreased consumption of natural resources
- Regulatory compliance
- Increased use of innovative remedial and pollution control equipment and technologies

- Increased purchase of recycled and recyclable materials
- Improved environmental performance
- Improved financial performance

Environmental management accounting is thus an attempt to identify and bring to light the resources utilised and costs imposed on the eco-system through the activities of the institution. It is a system of accounting designed to record the benefits and costs rendered by the environment to the institution and costs and benefits tendered to the environment by the same institution.

The most compelling reason for institution to practise environmental management accounting is the growing body of evidence indicating that environmental costs could make up a much larger proportion of the costs than the institution realises. EMA will also serve as a solid foundation for an environmental management system, or increase the effectiveness of an existing EMS.

In conclusion, having an EMA system in place allows the institution to:
- Better manage environmental costs;
- Better formulate business strategies;
- More accurately cost products and processes;
- Discover new opportunities to offset or minimise environmental costs through environmental thinking; and, finally;
- Include potential environmental costs in appraisal processes and investment analyses.

----------oooOOOooo----------

REFERENCE LIST

BROWN, L.R. 2001. *Eco-Economy: building an economy for the earth.* New York: Norton & Co.

ELKINGTON, J. 1998. *Cannibals with forks: the triple bottom line of 21st century business.* Gabriola Island BC: New Society Publishers.

EMBLEMSVåG, J. & BRAS, B. 2001. *Activity-Based Cost and Environmental Management: a different approach to the ISO 14000 compliance.* MA: Kluwer Academic Publishers.

GLOBAL ENVIRONMENTAL MANAGEMENT INITIATIVE. 1999. *Environmental improvements through business incentives.* Washington, D.C.

HAWKEN, P., LOVINS, A.B. & LOVINS, L.H. 2000. *Natural Capitalism: the next industrial revolution.* London: Earthscan.

INTERNATIONAL WEBSITE FOR ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA). [Online]. Environmental Management Accounting Research and Information Centre. Available at: http://www.emawebsite.org Accessed: 16/05/2002.

LITTLE, A.D. 1999. *Total Cost Methodology: internal managerial decision making tool*. New York: AIChE.

MOHR, P., FOURIE, L. et al. 1995. *Economics for South African students.* Pretoria: Van Schaik.

PARKER, T. 1998. *Total Cost Indicators: operational performance indicators for managing environmental efficiency*. Engineering Licentiate Dissertation. IIIEE Lund University.

REGENCY CORPORATION LIMITED & UNITED NATIONS ENVIRONMENTAL PROGRAMME. 1998. *Sustainable business: economic development and environmentally sound technologies.* London.

SOUTH AFRICAN BUREAU OF STANDARDS. 1996. *ISO 14001:1996, Environmental management systems.* SABS.

UNITED NATIONS DIVISION FOR SUSTAINABLE DEVELOPMENT. 2001. *Environmental management accounting: procedures and principles.* New York.

Environmental management accounting as a decision-making tool towards the implementation of an EMS.

The role of higher education in sustainable development

Conference paper

Theme: Implementation of environmental management systems in higher education.

Key words: environmental management accounting, environmental management system, decision-making tool, financial value, natural resources, waste management.

Author: Maryna Möhr-Swart

Head of Department of Environmental Sciences
Technikon Pretoria
175 Nelson Mandela Ave.
Arcadia, Pretoria 0001
South Africa
Tel: +27 12 318 6115
Fax: +27 12 318 6354
E-mail: mohrm@techpta.ac.za

Return to Contents

21. The Mangaung-University of the Free State Community Partnership Programme (MUCPP): A World-Class Model in Sustainable Partnership Development

Benedict Mokoena & Basie Wessels

MUCPP, Bloemfontein, South Africa

TABLE OF CONTENTS

1. INTRODUCTION

According to the 1996 Population Census, the Free State's estimated total population is 2,63 million, which makes it the smallest provincial population after the Northern Cape. Eighty four percent of the Free State population consists of Black people, with 0,11% Indians, 3% Coloureds and 12% Whites.

The distribution of the Free State population is 70% urban and 30% non-urban.

The province's poverty profile indicates that an estimated 66% of the Free State's population live in poverty. The Free State had the third highest poverty rate in the country in 1995 (World Bank Report on Key Indicators of Poverty in South Africa, October 19950. Since 1995 the poverty rate has increased in the province. The report of Central Statistics on *Measuring Poverty* confirmed that the Free State is rated as second highest in South Africa in this respect.

Until 1998 the province's economic activity was mainly concentrated in agriculture and mining. This dependence has declined since then, while the contribution of manufacturing, trade and services has increased, leading to a more diversified provincial economic structure. The contribution of the historically marginalised communities, however, remains limited.

Bloemfontein is the provincial capital with a population in excess of 800 000 people. As a consequence of the historical development of Bloemfontein and the policy of apartheid in South Africa, most of the black population of this area live in Mangaung, a geographically separate area adjacent to Bloemfontein. Mangaung, which means *the lair of the leopard* , has been in existence since 1861. It is the largest residential area for black people close to Bloemfontein. The inhabitants of Mangaung and Heidedal have a significantly lower standard of living than the majority of the white population in Bloemfontein.

2. STRONG AND POWERFUL COMMUNITY PARTNERSHIPS

In order to develop a strong and powerful South Africa, it is very important that we develop strong and powerful communities, partnerships and regions. The question that arises is: How do you do that?

The University of the Free State was also faced with this dilemma when a call for proposals for funding of community development/partnership programmes was announced by the W.K. Kellogg Foundation in 1991. The Foundation placed a high priority on the establishment of innovative, comprehensive, affordable primary care orientated health-care centres. The assumption was made that this long-term strategy depends on partnerships between institutions, communities and the service sector that will adapt health personnel education to better prepare personnel for delivering such services. "The absence of academic, community-based, primary health-care centres which can integrate the functions of care, research and teaching and that would balance the excellent tertiary-orientated models which already exist" was stated by the Foundation as an overriding problem.

Related to the above-mentioned sentiments, but at a later stage, the White Paper on Higher Education (1997) summarised the transformation of higher education in the country as:

? increased and broadened participation;
? responsiveness to social interests and needs; and
? cooperation and partnerships in governance.

According to the Final Report on Community Service in Higher Education (1998), the benefit yielded by community service programmes in higher education depends on the following factors:

? The articulation between the programmes and the curricula with which they are associated.
? The orientation of leadership in the higher education institution towards being more socially responsive through teaching and research.
? The extent to which the programmes provide a site for the realisation of teaching and research goals.
? Programme design and management.

Although the above-mentioned educational approaches were not comprehended to the same extent in the early nineties, the academic staff of the then Faculty of Medicine (Faculty of Health Sciences since 1997) and Faculty of Social Sciences of the University of the Free State, were keen to become involved in an initiative that could address the shortcomings in health-care delivery, as well as the education of health-care professionals. To this effect the development of the Mangaung-University of the Free State Community Partnership Programme (MUCPP) was envisaged.

With hindsight on the progress made, it becomes clear that the initiatives of the University in the early nineties related closely to the determining factors of benefit to partners.

3. PARTNER-RELATED PROBLEM STATEMENT

The lack of appropriate infrastructure in Mangaung, together with a lack of provision of adequate basic health and primary health-care services, created a situation in which a very high percentage of patients in need of even very basic health-care services utilised the services of a tertiary referral teaching hospital. In addition to the relative unavailability of appropriate primary health-care facilities, research also indicated that the perception of the community generally was negative, particularly with regard to accessibility of services as well as the sensitivity of staff to the health-care needs of patients. Rapid urbanisation took place after the removal of regulations restricting the free movement of black people. The resultant population influx and an increase in informal settlements in Mangaung created an increased demand for health-care services.

The policy of the local University of the Free State excluded black students until the late eighties. In addition to this restriction, the language of tuition until 1993 was predominantly Afrikaans, which is the third language of most black students. Primarily for these reasons the University was not accessible to the community of Mangaung and its credibility was jeopardised. Besides these drawbacks most of the black children came from disadvantaged school backgrounds and were therefore not equipped to meet the selection criteria of the University.

The training of health-care professionals at the University was primarily hospital-based and students therefore had little exposure to primary health-care services to patients or to taking care of their total health-care needs.

Past policies also created a situation in which mutual understanding between race groups and communities was lacking. Academics and health professionals as well as disadvantaged communities therefore required development. The development of all role players was consequently crucial to support the philosophy of and to become involved in community partnerships and development.

The above disempowerment of the partners which resulted from the historical realities of South Africa was important when considering the possibility of a true partnership between the black community of Mangaung, the University and the health-care authorities responsible for the rendering of health-care services in the area.

4. PROGRAMME OUTLINE AND DEVELOPMENT

4.1 Introduction

The programme development was process-orientated, including wide-ranging consultation with and involvement of the three partners, namely academic staff of the University, the members of the community of Mangaung and the health authorities. Although the programme development is/was clearly phased, it was apparent from the initial phase that the respective processes would follow the lines of horizontal strands and would be ongoing, and would therefore overlap. Evaluation of the programme and legal advice to the partners commenced during phase 2 and was ongoing thereafter. The ten phases and aims of the programme were:

? Phase 1: Exploration.
? Phase 2: Building a partnership.
? Phase 3: Ensuring ownership and governance of the programme by the partners.
? Phase 4: Building of an infrastructure.
? Phase 5: Operationalisation, including development of portfolios coupled with the implementation of programmes.
? Phase 6: Building the first temporary health-care centre at MUCPP in Mangaung.
? Phase 7: Extending broader partnership services to the community of Mangaung.
? Phase 8: New vision, mission and objectives (holistic) for MUCPP.
? Phase 9: A focus on holistic integrated economic development activities at MUCPP.
? Phase 10: Adding CHESP service-learning courses to the existing holistic MUCPP paradigm and activities.

The principles and values that were operative during the various development phases of the programme were participation, representation, communication, sharing of information and responsibility, consultation, joint decision-making, identification of the tasks and roles of partners, and sharing in planning and implementation.

4.2 Exploration – April 1991 to September 1991

The programme was initiated in April 1991 when, at the invitation of the Kellogg Foundation, the academics of the Faculties of Medicine and Social Sciences were invited to a meeting by the Head of the Dept of Paediatrics and Child Health at the University, to discuss the possibilities of a project proposal involving the University in rendering a primary health-care services to an identified community. An Academic Workgroup was constituted and after a series of meetings, a proposal was submitted at the end of May 1991. At this stage the input of the academics was dominant. The initial proposal was accepted on condition that the community will form a strong partners in future activities, and seed funding was provided for developing the final proposal for full programme funding.

4.3 Building a partnership – September 1991 > ongoing

The community members and community leaders of Mangaung were invited to a series of meetings in order to participate in the project. The aims of a programme related to community empowerment and involvement were explained, discussed and debated at length. General mistrust of the community members dominated the course of the meetings. This was to be expected in view of the historical factors outlined above, and was an obstacle to be overcome.

4.3.1 Needs identification

The purpose community partnerships is to address problems/needs by making people more aware of the realities of the communities around them. The identification of the needs of the partners is not a one-off process. It is continuous since new needs are continually identified as the programme develops. The initial needs assessment took place over a period of months and was characterised by a growing awareness of the mutual needs of the partners.

Needs of the community of Mangaung: A workshop was held in September 1991 with participants from 42 organisations in the community of Mangaung, academics from the University and existing state structures, who identified health-care and related needs in the community and prioritised them. This step taken at an early stage of the process, was successful, spelt out direction and gave the beneficiary community the opportunity to state their case. In all probability such an opportunity in their community was highly exceptional, and they accepted it with enthusiasm.

The problems and needs identified by the workshops were prioritised as follows: poverty and disempowerment; basic needs such as housing, roads, water, sewerage disposal and electricity; recreational facilities; social services for women, children and the aged; social problems such as teenage pregnancies and substance abuse; lack of early learning opportunities, school readiness and adult illiteracy; and unsatisfactory health services relating to the unavailability and inaccessibility of services and the insensitivity of health-care personnel.

In addition to the needs identification workshops, a community profile was compiled early the next year. This was done by means of rapid assessment from existing resources as a significant amount fo research had already been undertaken in Mangaung. Where the data was not generated by means of research or surveys, authoritative and knowledgeable persons in the community were consulted by means of interviews. This activity which involved members of several University departments and members of the Community Workgroup was a valuable activity for the extension and confirmation of the health-care needs of the community, an opportunity to expand knowledge on the strengths and weaknesses fo the larger community in the area, as well as an opportunity to enhance communication between groups and establish linkages with the community. In contrast to their attitude to previous research projects undertaken in the area, the community was enthusiastic and cooperative regarding the research effort.

At this stage it was apparent, in view of the disadvantaged nature of the community of Mangaung, that it would not be possible to engage the community in a programme that addressed only their health-care needs. As indicated, the community perceived their urgent needs to be wider and higher in priority than health-care.

Needs of the academic workgroup: The needs of the Academic Workgroup were never formally identified, but crystallised as the programme developed. It became clear that a need had developed to become involved in community development within the framework of the programme philosophy and that knowledge and understanding of the community of Mangaung was a necessity. As partners, academics were in need of development to enable them to adapt their management style to the bottom-up participatory approach. Academics also expressed a desire to become more involved in support programmes for black students which had already been instituted in certain departments of the University, and to adapt the training of health-care professionals to meet the health-care needs of the community.

Needs of the health-care professionals: The health professionals welcomed the opportunity to become partners and were extremely enthusiastic about becoming involved from the outset and about learning more about the community, the processes of community involvement and

participation. This programme opened up avenues that were previously unknown to them and presented an opportunity to enhance the credibility of health-care delivery and to get communities involved in the promotion of their health. As was the case with the academics, they also felt the need to adapt their management style.

In this phase of the programme the needs identification for all the partners culminated in the setting of clear objectives for the programme by the partners eighteen months after the first meeting was called.

Setting of clear objectives (1992):

? To establish an effective partnership between the community of Mangaung, the University and the health services in the area.
? To establish an effective primary health-care service for the community of Mangaung through intersectoral collaboration.
? To establish a community development programme for the community of Mangaung.
? To initiate affirmative action in the selection of students as well as to develop support programmes and bridging courses for disadvantaged students.
? To promote community-based training for the health-care professionals at the University and to adapt educational strategies accordingly.

4.3.2 Establishing organisational structures

Although an Academic Workgroup was constituted at the onset of the initiative, a need for liaison structures to drive and structure the process further and to represent other stakeholders, had been felt since the onset. Arising from this, a steering committee was constituted with two lecturers of the Medical Faculty, one nursing lecturer from the Faculty of Social Sciences and two members from the community of Mangaung. The process was further structured when a Community Workgroup was constituted at the end fo the first year, after several meetings with the community. Since its constitution, this group has been meeting monthly, and serves as a means to provide the community with a platform to deliberate on all issues that affect the partnership and the community. Prior to the establishment of the Trust in October 1994, the business of the programme was handled by an acting director, the steering committee and the two workgroups.

During 1992 the MUCPP further developed an organisational structure and operationalised its activities by means of a series of working committees that remained responsible to the steering committee. A liaison committee was established between the University and the programme to facilitate decision-making and reporting. The appointment of community, training and health services coordinators as well as a secretary as permanent staff during this period, was an important step to ensure the growth of the programme.

4.3.3 Involvement, participation and partnership

Although the community meetings were extremely well attended by the community and staff members of the health-care facilities in the area, the community initially responded cautiously to the concept of a partnership with the University. It was clear from the beginning that relationships of trust would have to be established prior to the establishment of partnerships. This process was slow and required a spirit of mutual respect and sensitisation to the needs of the various partners. It was equally important to establish values such as commitment to a common task and ongoing commitment at all levels of commu nity activity; sacrifice of individual interests if inconsistent with the ideals of the partners; sharing of a common vision leading to a contract and developing a common identity. This process had to be fostered and two successful workshops on community d evelopment and community partnerships, involving all partners, were held in the early stages of programme development.

Involvement and participation were also further strengthened by consultations with all University departments involved and regular meetings of the Academic Workgroup. The same strategy was followed for other community organisations and health-service providers in the area. Visits to other projects by the partners and attendance of workshops on partner-related issues by the members of the steering committee also proved to be very useful.

In these early phases it was already apparent that the involvement of the community of Mangaung would be one of the strong assets of the programme and that this commitment could become one of the major building blocks in its success. The strong element of community involvement built into this programme comes from the strong feelings that development and upliftment of the people is essential if the project is to succeed. It is a simple philosophy that puts power in the hands of ordinary people to enable them to control their own future and deal with their own problems. The group's negotiating skills and confidence in their own abilities have developed strongly. This was demonstrated when the community insisted on a logo for the programme, which with the vision statement of “HEALTH FOR ALL”, was solely designed by the community and approved for implementation by the other partners.

However, during this period concerns were expressed that a lack of transparency an d possible unknown factors might hamper progress. It was also felt that the community must be mobilised and should become a pressure group to advocate change and increase involvement of its members. Community members felt that they should be represented on the boards and structures of the University and that the influence and power of the educational institution should be directed to the needs of the community. The importance of communication and liaison, which includes the communication of information, good management and strategic planning, was also emphasised.

Although the health services have been enthusiastic in principle from the outset, the programme development went through a phase where community development and participation were fostered to such a degree that they (the health services) became marginalised to a certain extent. Uncertainly of the implications of the developments in the program for their respective organisations could also have played a role. This was also true of the academics when members of the community became more and more involved in the development of the second proposal, which was submitted in July 1992 and approved for funding. During the development of the programme more funders came on board, and hence provided sustainability to the programme.

4.4 Ensuring ownership and governance of the programme by the partners – July 1992 to November 1994

During all stages of programme development, it was assumed that significant control of the programme would rest with the community. The challenge was to create a structure that would not hamper the sensitivity of the process of programme development to the needs of the most vulnerable partners - those at grassroots level who use the service. This is extremely important, particularly for professionals who are inclined to implement strategies they regard as essential and logical and scientifically based. A pattern of relationships and a structured legal basis for the programme to ensure the autonomy, unique and separate identity, and local ownership of the programme had to be created. Several partner consultations with University legal advisers concluded that a trust would be a suitable legal entity for a community development programme.

The process of establishing a trust was an evolutionary and purposeful process characterised by wide consultations with the partners, and took 18 months. The first meeting of the Board of Trustees was held in October 1994, after the Trust Deed was registered with the Supreme Court.

The Trust Deed was based on the fundamental operating philosophy that all its activities should be based upon shared decision-making, and in its operations it would comply with the following guiding principles: non-racialism, non-sexism, a sound developmental approach, improvement of the beneficiary community, equity, and at least 50 % representation of the beneficiary community on all committees not otherwise designated in the Trust Deed.

The Trust functions under a Board of Trustees which comprises 16 board members of whom four are University personnel, three health services members and eight community members and a Management Committee which is equally represented by the three partners. Three forums (working groups) were constitutionally established, where partners can discuss relevant issues and problems, namely the Community Working Group, the Academic Working Group and the Bloemfontein Health Services Forum. Other working and liaison committees were established according to needs.

Financial control of the programme rests with the Board of Trustees. The University undertook to ensure sound financial management of the funds.

The establishment of a pattern of relationships among partners is indicated in Figure 1. The matrix structure is a balanced compromise between functional and product organisation by superimposing a horizontal structure of authority, influence and communication on the vertical structure. In the arrangement shown, people assigned to the functional units on the vertical level not only belong to the functional unit, but also to a particular task group on the horizontal level. This kind of structure enables the units on the vertical level to utilise the services of specialists on the horizontal level, to adapt or respond to a rapidly changing and uncertain environment, to achieve optimum autonomy, and to communicate efficiently with one another.

With these organisational structures in place the steering committee which stood at the helm of three and a half years, was dissolved.

4.5 Building an infrastructure - 1994 ongoing

The serious lack of infrastructure in Mangaung made the building of a multipurpose community health centre at a strategically placed site in Mangaung impetrative. It will house a primary health-care service component, a primary health-care training and development component, and a community resource centre. It has been decided to approach governmental as well as non-governmental sources for the finding of the centre. The University is also involved in other community-based research projects.

A centre/building committee was set up to determine the architectural needs of the respective partners. The concepts of building and planning were explained to the partners at a successful workshop. In addition the students of the Department of Architecture of the University planned community centres for final-year assignments and submitted these to the partners as part of the process of becoming acquainted with the planning and building process. The community participation in the planning of the centre was extremely enthusiastic and included visits to several successful end less successful centres. The process of planning and negotiating with governmental bodies took up to eighteen months, but was successful as regards partner involvement.

A matter that put the partnership to the test was the issue of ownership of the centre after the Provincial Administration undertook to build it. After a number of meetings, penetrating discussions and debating, the partners accepted that the Provincial Administration would retain ownership and that control of the centre would be vested in the Board of Trustees. This decision was a breakthrough in the attitude, nature and continuation of a true partnership and served as a watershed. This was also demonstrated by die Provincial Administration's agreement to appoint the architect chosen by the community.

Building of the multipurpose centre commenced early in 1997. In the interim phase temporary structures including offices, committee rooms, community hall and a kitchen had been erected on the site, whence the activities of the MUCPP, which were previously housed in the Medical Faculty of the University, are conducted. A temporary clinic was also erected on the site and was later expanded to a community health centre. These facilities were staffed by personnel of the Department of Health. Apart from these facilities, the physical presence of the MUCPP in the community is of crucial importance in order to maintain contact with the beneficiary community, to remain sensitive to their needs and to enhance their participation and involvement.

4.6 Operationalisation, including the development of portfolios coupled with the implementation of programmes – July 1992 ongoing

Putting plans into action commenced early in the programme, but progressed slowly as they were handicapped mainly by the energy absorbed by the essential process of structuring, as well as by the lack of infrastructure which had to be created first.

Eight staff members were appointed over a period of three years to assist and realise the implementation of the objectives of the Trust. The portfolios of the staff included community development, health services, education and training, youth development and administration. During this phase it was proven that a partnership could be managed with great success with the staff and the structures constituted through the Trust.

4.6.1 Community development projects

The aim of the various projects is to empower community people with skills and knowledge in order to create employment for themselves. This was done in a spirit of self-reliance, and in collaboration with a number of departments of the University and the Department of Trade and Industry where the necessary expertise was available and where clear commitment to become involved in community development was shown. These activities also provided an opportunity for intersectoral and interdisciplinary cooperation among departments. Examples of such projects are neurodevelopment for preschool children; emergency care; perinatal exercises and care of mother and baby; treatment of minor ailments; health workshops for the youth; geriatric care, life-skills training; economic and small business skills development; training in entrepreneurial skills; coffin-making; welding; basic taxi service/car service skills; chicken-farming; food gardens/ hydroponics and a sewing and knitting club.

Through the community development programme, community members are also encouraged to participate in the various structures of the MUCPP, to attend workshops in the development of leadership skills, to learn how to conduct meetings and to learn about the roles of office bearers.

The idea of starting cultural development at the MUCPP was born out of the realisation that the people's way of life influences their perception of the future as well as their personal development. After consultation with community members the MUCPP Youth Choir was established. Preparations are under way for starting an Afro-band.

The basic philosophy of rendering a health service to the community of Mangaung is that of a partnership between the health-care worker and the service recipients. The community was brought in as a partner through the structures of the MUCPP and the establishment of the community health committee, which have now been formed through the different areas of Mangaung. The area committees determine the respective needs and problems of the areas involved, and have so far embarked on a number of projects, e.g. clean-up campaigns and assistance to the aged. The following subcommittees have been established through their involvement; Health Education; Traditional Health, Referrals, Perinatal Committee and the Committee for persons with disabilities in the community.

The Youth Forum of the MUCPP felt obliged to contribute constructively to the normalisation to the education in the country. To this effect a Student Representative Course was instituted, which focussed on the building and development of mature sound leaders amongst the youth. Other youth activities include workshops on relevant health problems amongst the youth, a speech contest and the development of entrepreneurial skills.

In 1996 a full-time Recreation and Sports Officer appointed to facilitate the institution of a Sports en Recreation Development Programme. This programme is now offered at four different sport centres in Mangaung. The school children and community all benefit from the activities offered at these centres. Sport specialisation is also done to mould identified talented players into possible national competitors.

4.6.2 Educational and training of University students and research

Although some departments have already made curriculum changes in order to ensure more community-based training, the lack of clinical facilities in the community, and logistical problems were viewed as challenges.

A continuing education programmes for midwives, conducted through self-study modules in conjunction with skills workshops, commenced during 1994. Several departments commenced programmes on Video Supported Instruction in the same year to address the language problems of disadvantaged students.

The paradigm shift towards primary health-care, necessitated a change in educational strategy. The problem-based teaching and learning strategy and community-based approach to education is advocated internationally as suitable to support the philosophy of primary health-care. This method was successfully implemented as a pilot survey at postgraduate level in 1995 and was instituted in the nursing undergraduate programme in 1997.

Since 1997, with organised input of community members who operated through the health street committees, in collaboration with academic staff of the School of Nursing, first-year nursing students have been doing community profiles during the first-six months of their training, and spending the next eighteen months in community health settings. The Departments of Social Work, Occupational Health, Physiotherapy, Human Nutrition and the School of Medicine are planning and implementing a similar approach in the training of students.

Where appropriate, students and academic staff are also involved in the community development projects mentioned, and in rendering health-care to the beneficiary community.

Selection criteria have been adapted to address the potential of disadvantaged students. Support programmes and supplemental instruction through the CAREER PREP PROGRAMME of the Academic Development Bureau of the University, the Educational Development Division of the Faculty of Health Sciences, as well as through academic departments, were introduced to give students the opportunity to develop to their full potential. In addition the University has adapted its language policy and parallel-medium instruction has been implemented to accommodate the language needs of non-Afrikaans speaking students. Bursaries are awarded to disadvantaged students to take care of their financial needs and encourage further development.

5. SUSTAINABILITY THROUGH CONTINUING EVALUATION

During the first three years of the programme, external evaluation was done by a part-time University industrial sociologist, but this task was later taken over by national and international consultants, appointed by the respective donors of the programme. This process is ongoing.

The aim of the performance evaluation is to initiate and develop an evaluation process by means of which performance could be assessed and corrective actions could be taken. In this respect evaluation is not seen as the sole responsibility of the external evaluator, but should be seen as a process of self-evaluation and development, and the role of the evaluator in this regard as a facilitator of the process of evaluation. The phase and activities of the evaluation process consist of:

? Phase 1 – Ongoing data-gathering and establishing a criterion. (This includes the development of a conceptual model with special reference to elements of the management subsystems and organisation culture.)
? Phase 2 – Performance appraisal and analysis.
? Phase 3 – Feedback to all stakeholders, elaboration by these groups, discussions and work on information.
? Phase 4 – Correction such as action planning and action intervention.

Over the last two years the University of Pretoria was contracted by the WK Kellogg Foundation to do a proper evaluation of the seven Community Partnership in Health Personnel Education (CPHPE) programme in South Africa where the WK Kellogg Foundation was the donor from 1991 to 1997. The University of Pretoria focussed on the outcome of "sustainability" in the different projects. Their findings were (we received the document in May 2002):

High sustainability:	MUCPP (Mangaung-University of the Free State Community Partnership Programme).
Moderate sustainability:	Project 2 Project 3 Project 4
Low/no sustainability:	Project 5
Could not be assessed:	Project 6 Project 7

They used the spider-web model in order to assess community participation in health programmes. The model attempts to encapsulate the complexity of community participation and provides a tool to assist those involved in PHC programmes to describe participation in their programme and upon that basis plan their future actions. They identified six key aspects:

i) well-conducted needs assessment;
ii) leadership;
iii) organisation;
iv) resource mobilisation;
v) management; and
vi) funder support.

The University of Pretoria took three projects:

One highly successful programme:	MUCPP
One moderately successful programme:	Project 4
One lowest scoring programme which fell apart as soon as WK Kellogg funding came to an end:	Project 5

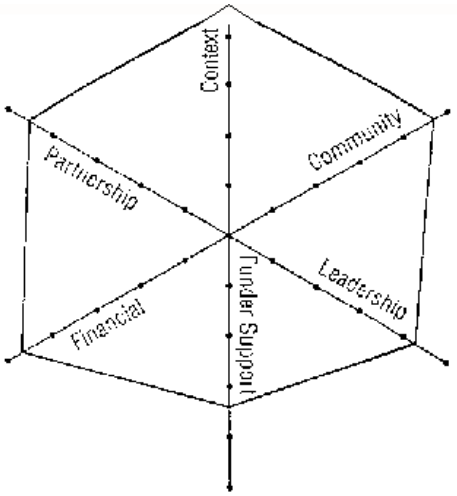
The total instrument consists of:

i) Four structured questionnaires of a more or less quantitative nature focussing on overall programme sustainability of the three core CPHPE functions (i.e. community-based education, health service delivery and community projects).

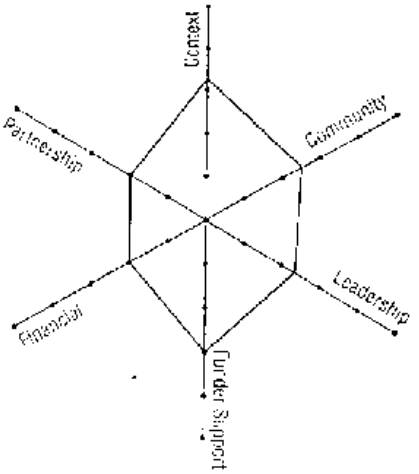
ii) Additionally four semi -structured questionnaires, one for the overall programme and one for each of the three CPHPE core functions, can be used to obtain further qualitative information from key informants, if deemed necesssary.

iii) A spider-web diagram with six axes to graphically represent progress on each of six core components of programme sustainability.

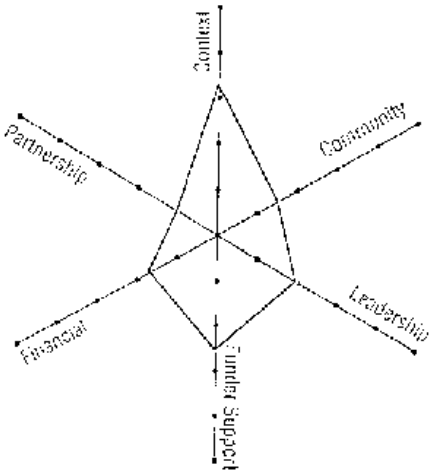
The three spider-web diagram results from the three projects, as found from the University of Pretoria, were:



MUCPP



Project:
Project 4



Papers a

Project:
Project 5

6. CONCLUDING REMARKS

The programme was initiated during the socio-political transition in the country and proved to be congruent with the philosophy of the holistic policies of the new government which came into power in 1994. We therefore believe that the programme could be a model for partnerships and the planning of future services. Although the needs of all the partners are being addressed to a greater or lesser degree as the programme progresses, the time is now ripe to pay more attention to them as the structure has been consolidated.

From this programme key messages for possible success which emerged, were: early vision and understanding; addressing the real needs; assuring ongoing participation; involvement of all the stakeholders; ensuring sustainability of the programme through the implementation of realistic time-frames and funding cycles; the integration of other educational institutions; fields and departments at the University as well as building upon identified strengths and assets of the respective partners. The use of an integrated model with a holistic approach, contributed to this success.

In order to get an idea of the broad and rapid growth of activities at MUCPP, it is necessary to refer to some great advancements made by the MUCPP in the Mangaung community.

GREAT ACHIEVEMENTS MADE BY THE MUCPP PROGRAMME IN THE MANGAUNG COMMUNITY

1991-1994: The bringing together of the various partners – partners who actually did not know each other at all; as well as the spelling out of a MUCPP situational analysis and the compilation of a constitution which would satisfy all the partners.
1994-1995: A temporary site with three “containers” is begun in Mangaung.
1995: The community centre is added to the three “containers”.
1995-1996: Boikhuco Home for the Aged receives the Organisation of the Year award of the *Ons Stad* and the Bloemfontein Publicity Association.
1995-1996: Rev. M. Chabaku, community leader and at that time, Speaker of the Free State Provincial Government, is appointed Bloemfonteiner of the Year.
1995-1996: MUCPP wins AVCASA's Peace Garden of the Year award.
1996: The opening of MUCPP's first temporary Health Centre.
1996: MUCPP and the Department of Works (Free State Provincial Government) are jointly awarded a gold medal for their exhibition at the Bloemfontein Show.
1996: Mr Joe Mokoka is nominated as a candidate for Bloemfonteiner of the Year.
1996-1997: MUCPP receives the Organisation of the Year award of *Ons Stad* and the Bloemfontein Publicity Association.
1997: The whole MUCPP complex is demolished down to its foundations so that a start can be made with the permanent Health Centre by means of funds provided by the Department of Health of the Free State Provincial Government.
1997: The MUCPP complex is rebuilt on the north side of the Comtech High School. A beginning is also made with the permanent Health Centre.
1997: The MUCPP choir wins the national ATKV competition.

1998: The MUCPP Sports Centre is built with soil extracted from the underground parking terrain of the permanent Health Centre.
1998: A start is made with the building of the MUCPP's Health Centre, worth approximately R25 million (provided by the Department of Health, Free State Provincial Government).
1998: The installation of computer technology at the MUCPP's Health Centre
1999: A start is made with the building of the R3-million multipurpose Economic Development and Training Centre (funds provided by Ireland Aid).
1999: Opening of the brick-making factory on the MUCPP/CHESP site. Approximately 50 to 100 people have generated jobs for themselves here. Approximately 50 low-cost houses have also already been built here.
2000: The making of window-sashes for the Economic Development and Training Centre on the MUCPP/CHESP premises.
2000: Official opening of MUCPP's processing unit.
2000: Official opening of MUCPP's agricultural pillar – Etsa Phapang (80 hectares provided by the Bloemfontein Municipality).
2000: CHESP (Bloemfontein) submits its strategic plan (based on a macro-holistic model) to the Joint Education Trust/Ford Foundation – a strategic plan offering all Bloemfontein residents the opportunity to participate in the wonderful future of South Africa.
2000: Official opening of Afrotique at MUCPP.
2000: Official opening/commencement of MUCPP/CHESP's Driving School (Technikon Free State).
2000: MUCPP/CHESP's disabled basketball team wins the national competition. (Numerous sportsmen/sportswomen/trainers/coordinators are selected for provincial/national teams).
2000: Official commencement of the training of community workers involved in CHESP's bakery.
2001: Official handing over of the keys to the owners of the new houses of Turflaagte (Mangaung) – MUCPP low-cost housing project (50 houses).
2001: Official opening of the bakery.
2001: Partnership workshop: Service learning programmes.
2001: Official opening of the multipurpose Economical Training Centre.
Official opening of the Permanent Health Centre.

Portfolio activities during 2002

Health

12 hour per day services

General Health Centre Activities every day:

? Chronic diseases
? Minor ailments
? TB
? Immunisation

? Reproductive services
? HIV/Aids
? Nutrition
? Maternity
? Home-based care

24 hour per day services
? Labour ward – deliveries

Economical/Agriculture
? Hydroponics.
? Chicken.
? Brick-making (Construction).
? Yoghurt.
? Bakery.
? Food Gardens.
? Sewing & Knitting.
? Indigenous food.
? Entrepreneurship development.
? Welding.
? Literacy.
? Numeracy.
? Fish farming (about to start).

Education (Service-learning)
? Economical development.
? Building.
? Entomology (Agriculture).
? Agriculture (Agricultural Management).
? Psychology, Human Movement.
? Private, Commercial and Procedural Law.
? Family Medicine.
? Nursing.
? Training Centre Activities.

Sport & Recreation
? Basketball (able, disabled).
? Table tennis (able; dis abled).
? Rugby (quadriplegic).
? Cycling (disabled).
? Cricket (senior).
? Aerobics.
? Badminton.
? Gholf.

? Netball.
? Recreation.
? Cricket for the blind.
? Love-live programme.

Youth

? Love-life programme (schools involvement).
? HIV/Aids & Std.
? Entrepreneurship courses.
? Counselling.
? Link with Sports & Recreation.
? Cultural development.

Administration & Finance

? Finance activities.
? General administration activities.
? Logistical activities.
? Secretarial activities.
? Managerial activities.

The expansion of the programme on a subregional/regional basis remains an important challenge and opportunity in the future of the programme.

There is little doubt that partnerships like MUCPP (University of the Free State, Mangaung community and the service sector) are well suited to play a major role in local, regional and national development and should be committed to do so. In a very humble way we think that MUCPP is a world-class model in sustainable partnership development.

Return to Contents

22.Concepts and pedagogical strategies in Earths Systems Science Education in Teaching Sustainability for K-12 Teachers

John D. Moore,

Burlington County Institute of Technology, Medford, New Jersey USA

John D.Moore
Teacher of Environmental Studies
Burlington County Institute of Technology
Medford, New Jersey USA
jmoore@bcit.cc

Introduction

Using an Earth Systems Science approach in teacher preparation, the incorporation of new instructional strategies and through applying current and emerging technologies, the K-12 education community can break the current science education paradigm and influence not only the way people think about sustainability, but ultimately make wise decisions. Following the Environmental Education paradigm developed in the 1970's, this chapter focuses on introducing new concepts and pedagogical strategies to the K-12 community, which in turn provides the next generation with a new approach, but also has a dramatic impact on their parents. To accomplish this, an examination of pre-service teacher preparation, in-service professional development, and an identification of how and where these concepts and strategies fit into an already full curriculum will be required.

This paper will first review parallel developments in the fields of remote sensing, technology, and science/environmental education that bring us to point in time where a new paradigm can be first identified and then established. As teachers are exposed to first, the new resources that available, and teaching strategies that allow students to participate in problem-based inquiry learning, the opportunity to engage in real investigations can lead to a comprehensive understanding of sustainability. Based on real observations and/or ground truthing, and developing and understanding of and identification of ecological relationships, students can conduct investigations, study possible solutions to real problems, and apply what they have learned.

Background

Over the past four decades information and data collected from satellites in space and other remote sensors, have presented volumes of information, satellite imagery and now computer visualizations that, for the first time in the history of Planet Earth, allows for scientists and educators alike to gain a new and unique perspective of our planet. The advantage of using remotely sensed data and imagery is that much can be learned about geographic locations, many

which cannot be easily accessed, if at all. For the first time in human history, the entire surface of Planet Earth can be viewed, analyzed and interpreted. Scientists and educators have therefore, the capability of looking at the planet as a total global system, a sum of integrated systems, physically interacting in a constantly changing fluid and dynamic state. An integration of well-established academic and scientific disciplines such as Meteorology, Oceanography, Geology and Biology can now be viewed in a systems approach that will lead to a deeper understanding of our planet and the impact of human activity on environmental processes rather then fragmented or reductionist approach.

As part of teacher preparation, students are required to take coursework that introduces perspective teachers to current science education methods. Unfortunately, often these do not include inclusion of innovative technologies, nor do they make known the availability of an achieve of earth data.

A New Paradigm

"*A strong pre-college component provides a crucial foundation for geoscience education at all subsequent levels: undergraduate, graduate, and postdoctoral, as well as for the general public*."(NSF).

It is therefore important to define Earth Systems Science Education as a precursor, and establish the relationship to the traditional science and science education paradigm.

Earth system science views the Earth as a synergistic physical system of interrelated phenomena, governed by complex processes involving the geosphere, atmosphere, hydrosphere and. Biosphere.

...the challenge for educators to develop and offer courses in the classroom that provide this deeper understanding is demanding. Earth system science seeks to construct an overarching interdisciplinary framework of process and state of the system, and at the same time retain the strength of traditional disciplines for understanding fundamentals and complex interactions

... the challenge is to provide the necessary depth and breadth needed to serve as a foundation for advanced study among majors, and lay the foundations for sustainability and informed stewardship in striving for an Earth-aware society.

... building on the traditional disciplines to study the Earth, the system approach has become widely accepted as a framework from which to pose disciplinary and interdisciplinary questions in relationship to humankind. Earth system science forms the foundation of NASA's Earth science vision as well as the basis of the NSF geoscience long range planning effort as part of the nation's global change research objectives.

This approach is clearly aligned with issues in developing educational programs dealing with **Sustainability**. Scientific societies such as the American Meteorological Society and the Geoscience and Remote Sensing Society have clearly identified goals that lead to incorporating remotely sensed data and satellite images into not only education, but to society for the purpose of making perhaps better and wiser decisions that protect life and property. Suppose that type of product addressed issues in sustainability? They should be, and the good news is, they can be.
Earth Data Towards a Sustainable Future

Throughout the last two decades, NASA has devoted much of their resources on a massive project called "Mission to Planet Earth."

The overriding principles and objectives of the Earth Science Enterprise that relate to education are to:

- Demonstrate relevance to society
- Operate and work within NASA's strategy for education
- Focus the implementation of a sustainable Earth system science education program that is consistent with externally imposed education standards
- Increase the involvement of ESE scientists in education
- Involve teachers in the development and decision-making aspects of education activities
- Coordinate (and perhaps integrate) strategy and programs with other agencies/organizations

Specifically related to education are the following objectives:

- Train the next generation of scientists to use an interdisciplinary Earth system science approach
- Continue to educate and train educators as research evolves and capabilities change
- Raise awareness of policymakers and citizens to enable prudent policy determination regarding global change
- Improve science and mathematics literacy
- Strengthen the interface between educators and scientists and secure greater support by scientists for broad education efforts

The concept while profound, is quite simple, to develop space platforms and remote sensors to look at Earth. Consequently, there is an archive of data several decades in the making. This data at one time was only available in formats that required very advanced computer resources and highly trained specialists to interpret that data. As one can see, significant effort to integrate this information into mainstream education has taken place. In recent years an educational undertaking begin to bring Earth System Science Educational materials into the hands of educators, it is called the “Digital Library for Earth Systems Science Education (DLESSE). Most recently (2002) a subset collection of materials are being developed centered on the specific topic of water, called the “Digital Water Education Library” (DWEL). This will be the first collection of its kind identifying 500 exemplary sites with a specific K-12 audience. These projects are strong indicators of the direction of Geoscience Education.

The Shift in the Educational Paradigm Begins

Several educational efforts funded by the National Science Foundation over the past decade, have developed new instructional strategies, supported by educational research, that provide direction and a framework for this new paradigm through addressing the similarities of several projects. They are: Learning through Collaborative Visualizations (CoVIS), NASA Classroom of the Future (COTF), Global Learning and Observations to Benefit the Environment (GLOBE), the NASA S'COOL Project, and two educational initiatives from the American Meteorological Society, The DataStreme Project, and Water in the Earth System (WES). These projects share common goals and strategies such as Problem-based learning, scientific inquiry, the use of remotely sensed data, development, application and inclusion of new technologies in the classroom, and doing science like scientists do.

A constructivist model for workshops in Earth System Science that enhances the preparation of K-12 teachers was developed. (NASA Pre-Service Teacher Enhancement grant (1997-2000), West Chester University, West Chester Pennsylvania, USA Bush, Moore). Through this project both pre-service and in -service teachers were trained in the pedagogical strategies for teaching Earth Systems Science in order that Mission to Planet Earth (MTPE) materials and Earth System Science can be integrated effectively into pre-college education. Teachers must be trained in the strategies that enable them to intergrate materials, concepts, and technologies into the scope-and-sequence of their specific school curricula, state mandates in both science and environmental education, and the national science standards (National Research Council, 1996). Earth System Science concepts and technologies have become a mechanism to integrate collaborative research efforts among faculty and students.. Pedagogical strategies recommended for fostering science literacy by the National Science Education Standards and in Benchmarks for Science Literacy (Rutherford, 1993). Recent pedagogical research recommends that effective learning occurs when students: a) are engaged in learning that they view as relevant to their lives, b) use inquiry - based strategies to seek solutions to science problems that are realistic and pertinent, and c) employ cooperative learning approaches (Cuseo, 1992; Novak, 1993). Promotion of science - technology-society (STS) triad (Yager, 1993), constructivist strategies (Bykerk-Kauffman, Kerlinger, and Johnson, 1996; Fosnot, 1989, open-ended inquiry approaches (Lueck, 1970), higher-order thinking strategies, and computers as cognitive tools (for knowledge construction rather than knowledge consumption).

Developing Teacher Leadership

The American Meteorological Society has developed and implemented several on-line but locally implemented courses that are based on incorporating real time data into the K-13 classroom and promotes developing strong content that leads to leadership at various levels. The DataStreme Project is a major pre-college teacher enhancement initiative of the American Meteorological Society (AMS). Its main goal is the training of Weather Education Resource Teachers who will promo te the teaching of science, mathematics and technology using

weather as a vehicle, across the K-13 curriculum in their home school districts. The instructional strategy of the course is to develop concepts using real time meteorological data or the study of weather "as it happens." The National Science Foundation funds the Project with assistance from the U.S. National Weather Service and the State University of New York College at Brockport. Based on this model, the AMS has developed and implemented a course, "Water in the Earth System," (WES) that once again, using real time data and visualizations and examines the roles and interactions between the atmosphere and the oceans. The course incorporates inquiry-based instructional strategies and a holistic concept of Earth from oceanic, atmospheric and terrestrial water and problem-focused perspectives. Most recently the AMS Education Program has embraced the necessity of the delivery and use of real-time data in the updating of the course(s), i.e. *DataStreme Atmosphere, DataStreme WES, and under development DataStreme Oceans.*

These educational initiatives represent how the use of real time data, and technology can address the National Science Standards, and aid in the provision of the greatly needed professional development of in-service teachers. These types of instructional strategies play a vital role in creating the necessary change in pedagogy

Pre-College Students Apply Concepts and Technology

A demonstration project has introduced participants to the GLOBE Program, an international K-12 environmental/science education program. Students and teachers throughout the world have been working since 1995 with Global Change Scientists in making scientific observations following strict protocols and sharing a database on the Internet. Data from these geo-referenced schools, which includes atmosphere, hydrology, soils, land cover and more, has been incorporated into this project. With the educational assistance of both ESRI and Intergraph, providing their GIS products to the K-12 Community, (ArcView and GeoMedia), “The Digital GLOBE Project” grew out of a response to a national effort known as the Digital Earth Initiative, first introduced in 1998 as a possible user scenario. The Digital Earth-GIS Project can be viewed on GLOBE's Web page at www.globe.gov, under "School Collaborations." With nearly 50 U.S. and international schools participating, the Digital GLOBE Project has developed a true international K-12 learning community that can share and exchange data and ideas, which can be displayed through GIS. It is the intent of this project to have representation from at least one school from every country, so that GIS can be used as a common language and tool for the understanding, conservation, and preservation of Planet Earth. More recently, ground truth data from the NASA S’COOL Project, an international atmospheric science project, has been incorporated into the dataset adding another layer of observations, but also can be used in conjunction with the GLOBE atmospheric observations. The sharing of data is of utmost concern to the science community, and collaborative inquiry-based learning with real-life applications is the current accepted practice in the science education community. This project represents how the educational goals of the science, technology, and environmental educational communities can be explored together in a real and practical way while introducing GIS to the next generation of learners.

The GLOBE Program, and the NASA S'COOL Project, are both directly linked to the National Science Standards, both in content, and in science education pedagogy. Perhaps more importantly, this project represents how many evolving educational disciplines over the past forty years, i.e. science education, environmental education, and technology education. The disciplines can unify goals and objectives and further technical careers through providing students with doing science like scientists do, in a relevant and meaningful to them, they can see the applications of what they are leaning.

The Digital Earth Initiative (www.digitalearth.gov)

*"Digital Earth will be a **virtual representation** of our planet that enables a person to **explore and interact** with the vast amounts of **natural and cultural information** gathered about the Earth."*

Recognizing this challenge the *National Digital Earth Initiative* was created to enable and facilitate the evolution of Digital Earth, a digital representation of the planet that will allow people to explore and interact with vast amounts of natural and cultural information. Students and teachers will be able to search the planet, requesting information on land cover distribution of planet, animal species, real-time weather, roads, political boundaries, and population. Imagine the quality of decisions that can be made by citizens, community leaders, business, and government leaders. *Digital Earth* is several things: a way to obtain information about the Earth; a framework in which to publish information; a new market for data, software and services; a set of standards; a local, national, and international collaboration a near-term " A primary goal of Digital Earth is to unlock the world's knowledge by simplifying access to geo-referenced information, which is information that relates to a particular spot or area of the earth.

The GLOBE Program (www.globe.gov)

On the 25th anniversary of Earth Day (April 22, 1995) the GLOBE Program officially began. Global Learning and Observations to Benefit the Environment (GLOBE) is a hands-on international environmental science and education program. GLOBE links students, teachers, and the scientific research community in an effort to learn more about our environment through student data collection and observation. The goals of GLOBE are to:

- enhance the environmental awareness of individuals throughout the world
- contribute to scientific understanding of the Earth
- help all students reach higher levels of achievement in science and mathematics.

GLOBE is a hands-on, minds-on K-12 project in which students will become the environmental experts for their study sites. The GLOBE Program fosters the creation of a worldwide research team, comprised of students and teachers in collaboration with environmental scientists for generating knowledge about the Earth as an interconnected system. Learning activities are designed to promote the understanding of science using tools such as visualizations and satellite

images. The inquiry process used by the GLOBE Program is an approach to learning, which parallels the scientific method used by scientists. Protocols focus on data collection and data reporting. The activities broaden from the data collection and data reporting to include other parts of the inquiry process such as formulation of hypotheses, analysis of data, and drawing of conclusions. As students achieve higher levels of scientific understanding, they are challenged to move from a specific discipline to a multi-disciplinary perspective and from a local to a global perspective. GLOBE adheres to such pedagogy as: concepts of authentic learning, student-scientist partnership, and inquiry-based.

The GLOBE Program website itself is a wealth of geo-referenced information, data and educational activities. These activities present the concepts to be used in this project. Students can engage in and practice activities and various tutorials which allow students to gain an understanding of the environmental data that they will be using to construct a GIS data-base.

Through the GLOBE Program teachers and students have the opportunity to participate with other GLOBE schools from around the world through a format called "School Collaborations". "TheDigital Earth-GIS" (Moore, 1998) which has established a significant international learning community. This is an important concept because as the learning community is established, topics or special issues, such as Sustainability, can be addressed, with the common language of a GIS database. Since that time, the project has been renamed "Digital GLOBE", as to not be confused with the "Digital Earth Initiative". Current participants are (and the list continues to grow):

Moderator: Mr. John D. Moore, Burlington County Institute Of Technology, Medford, NJ United States
Participants:

- Lyn Harper, Kinard Elementary School, Clover, SC United States
- Ms. Kathleen R. Mitchell, Kimball Elementary School, Concord, NH United States
- H. Claus Roennebeck, Gymnasium Rahlstedt, Hamburg, Germany
- Mr. Patsy Cicala, Poughkeepsie High School, Poughkeepsie, NY United States
- Mr. Brian Doyle, Noble Junior High School, Berwick, ME United States
- Mr. Chuck Drake, C.D. Hylton High School, Woodbridge, VA United States
- Yan Dazheng, Shenzhen Experimental School, Shenzhen, China
- Marcia Craft, Northville Central School, Northville, NY United States
- Mr. William Dyke, East High School, West Chester, PA United States
- Mr. Gordon Davis, Walker Memorial Academy, Avon Park, FL United States
- Mr. Wayne Gilchrest, Dutchess Academy Of Environmental Studies, Poughkeepsie, NY United States
- Mr. John Caldwell, Crescent Elk School, Crescent City, CA United States
- Ewa Czupry, XI Liceum St. Konarskiego, Wroclaw, Poland
- Mika Vanhanen, Enon kirkonkylan ala-aste, Eno, Finland
- Mr. Todd E. Toth, Waynesboro Senior High School, Waynesboro, PA United States

- Ms. Toni Smith, E.L. Bouie Traditional Theme School, Lithonia, GA United States
- Mrs. Nora Ziegler, Hillsdale Elementary School, West Chester, PA United States
- Ms. Gayle Sellers, Royersford Elementary School, Royersford, PA United States
- Frank Ebiner, La Puente High School, La Puente, CA United States
- Ms. Wendy Barcroft, First Colonial High School, Virginia Beach, VA United States
- Dr. Klaus-Peter Schmitt, Kopernikus Gymnasium, Wissen, Germany
- Mr. Dave Foord, Paul F. Brandwein Institute, Dingmans Ferry, PA United States
- Aili Alatsei, Rakke Gymnasium, Laane-Virumaa, Estonia
- Asta Voutilainen, Björksätraskolan 6-9, Sandviken, Sweden
- Ms. Kathy Reynolds, Milken Community High School, Los Angeles, CA United States
- Ms. Marina Grcic, Sumarska Skola Karlovac, Karlovac, Croatia
- Bernd Tissler, Gymnasium Ohmoor, Hamburg, Germany
- Mr. Keith Rees, Forest Street Primary School, Wendouree, VIC Australia
- Zelimir Trlek, OS Konjscina, Konjscina, Croatia
- Mr. Evan Justin, McMurray Middle School, Vashon Island, WA United States
- Ms. Diane Duncan, Ferson Creek Elementary School, Saint Charles, IL United States
- Anne Riles, Sope Creek School, Marietta, GA United States
- Mr. Roger Skillman, Walhalla Middle School, Walhalla, SC United States
- Ms. Sanja Knezic, OS Matija Gubec, Gornja Stubica, Croatia
- José Luis Escuer Ibarz, IES "Ramón J. Sender", HUESCA, Spain
- Alenka Bujan, OS Draganici, Draganici, Croatia
- Mr. Steve Engelmann, Palisades Charter High School, Pacific Palisades, CA United States
- Vesna Brlek, OS Marija Bistrica, Marija Bistrica, Croatia
- Jiri Suchy, Zakladni Skola Banov, Banov, Czech
- G.B. Berenos, AMS, Paramaribo, Suriname
- Ioannis Orfanos, 3rd Lyceum of Aigaleo, Athens, Greece
- Ms. Marina Gojkovic, Gimnazija Matija Mesic, Slavonski Brod, Croatia
- Alev Sirikci, TED Ankara College Foundation, Ankara, Turkey
- Susan Newbury, Thurston Middle School, Springfield, OR United States
- Casey Teliczan, River Valley Academy, Rockford, MI United States
- Timo Peuraniemi, Lintumetsan Koulu, 02600 Espoo, Finland
- Robert Schwarz, HTBLU.VA Graz-Gosting, Graz, Austria
- Teresa Lopez Alija, IES "Juana de Pimentel", Arenas De San Pedro, AVILA, AV Spain
- Shen Yang, No.2 Middle School, Shenyang City, China
- Ms. Betty M. Welsh, Centennial Campus Middle School, Raleigh, NC United States
- Helen M. Magee, Tylertown High School, Tylertown, MS United States
- Christer Slotte, Virkby Gymnasium, Virkby, Finla Finland
- Kay Jackson, Oak Tree Elementary, Gilbert, AZ United States
- Theodorou Neophyta, Gymnasium Yeroskipou, Pafos, Cyprus
- Silvia Gysler, Primarschule Trittenbach, Taegerwilen, Switzerland

- Nittaya Phattanamas, Banyangsung, Kanchanaburi, Thailand
- Sune Jeppson, Vannarodsskolan, Sosdala, Sweden
- Juhasz Istvan, Gábor Áron Gimnázium,Egészségügyi Szakközepiskola és Kollégium, Karcag, Hungary
- Bjørn Vegard Johnsen, Rogne skole, Rogne, Norway
- Ms. Sanja Knezic, OS Matija Gubec, Gornja Stubica, Croatia
- Marcia Craft, Northville Central School, Northville, NY United States
- Mr. Todd E. Toth, Waynesboro Senior High School, Waynesboro, PA United States
- Martin Anscombe, Hoe O Tainui, Ohinewai, Waik New Zealand
- Ms. Susan Allick, St. Croix Central High School, Christiansted, VI United States
- Giovanni Imbalzano, Liceo Scientifico Majorana, Moncalieri, TO Italy
- Roumyana Kostova, Mihail Lakatnik Primary School, Bourgas, Bulgaria
- Wade Carpenter, Sir John Franklin High School, Yellowknife, NT Canada
- Helgi Holm, Storu-Vogaskoli, 190 Vogar, Iceland
- Mr. Scott Noble, Shawnigan Lake School, Shawnigan Lake, BC Canada
- Gemma L. Calvo, Philippine Science High School Mindanao Campus, Davao City, Philippines
- Natalie Todorova, Municipal Kids Center, Balchik, Bulgaria
- Ms. Kiran Chhokkar, Centre for Environment Education, Ahmedabad, India
- M.Ngouffo Grace, Lycee Technique Industriel Et Commercial, Bafoussam, Cameroon
- Frau Pfitz, Chemisches Institut Dr. Flad, Stuttgart, Germany
- Mr. Brian Doyle, Noble Junior High School, Berwick, ME United States
- OLA EID, GERMAN SCHOOL, BEIRUT, Lebanon

Summary

Students and teachers have begun the process of gathering data in each location. Observations and measurements from thousands of schools are available on the GLOBE website, however the Digital GLOBE schools are working specially on creating a GIS database. Other visualization tools developed by NASA are available on-line to display data for use in the classroom. Students using email can communicate with each other to ask for specific requests, or to verify data. To date, and exchange of information has occurred that includes: LandSat Imagery (supplied to each GLOBE school), photographs of environmental study sites, schools and cultural points of interest. In addition, student ground truthing observations as part of the NASA S'COOL Project can now be displayed, adding yet another layer of data/information. Datasets from the USGS website i.e. earthquake and volcanic activities, are currently in a geo-referenced format, and therefore are being incorporated into the project. Teacher enhancement by the AMS is an excellent example of the collaborative efforts between scientific societies and education, which produce leadership, which in turn directs policy.

Conclusions

Issues of sustainability need to occur at all levels, local to global. It is really a decision making/policy making practice. Good decisions are always based on good data/information. This implies two things, (1) the data exists, and (2) it is shared. Currently, data sharing is sometimes controversial, however the students we teach now, need to learn, particularly concerning issues of sustainability, that working collaboratively is the only way a "global" sustainable future can be insured.

Return to Contents

23. Implementation of Environmental Management Systems in Universities - Practical Experiences

Josef Noeke

University of Paderborn, Germany

1. Application of the Integrated System in a Subsystem of a University

Private such as public institutions get more responsible for their environmental effects than they've been the last years. According to the innovative management basics, ecological tasks must be gone active and providing. The aim of an environmental management system is to go on those "looking-ahead"-tasks systematically and oriented on operational environmental protection targets and to see them as a management task.
This paper describes the basics, which were necessary to develop and implement an integrated management concept in the group "process engineering" of the faculty "mechanical engineering" at the University of Paderborn. This management concept includes aspects of quality assurance, environmental protection and work safety.

Universities have to move „pushed" or „pulled", stagnation can also be interpreted as a back step. In the past, accidents e.g. in the chemical industry have shown that the protection of the natural environment is not easy to guarantee. An effective environmental management system must be used additional to the ordinary techniques to ensure that the "human factor" won't get the weak point in the safety-chains. Environmental management systems try to eliminate such safety deficits by a stronger inclusion of the personal component.

Interfaces to **work safety** and **quality assurance** are included into the implementation of an environmental management system; reasons for that are:

- high parallels existing between work safety and environmental protection in the handling of dangerous materials;
- a global sight for the own acting is necessary. These themes shouldn't be seen isolated;
- the necessary audits will be carried out together; the acceptance of the management system will increase.

Currently, 20 scientific employees are working at the specialised group "Mechanical Process Engineering and Environmental Process Engineering" at the University of Paderborn. Most of these employees are PhD students working on public or industrial sponsored research projects.

Administration and employees work in different offices and laboratories as well as in workshops and testing stations with a total area of about 1.200 sqm. In addition, there are the lecture and

seminar halls, which are provided by the university. The amount of third-party funds runs up to ca. 1 Mio € per year.

The specialised group is today working on these areas:

High viscous/ Data systems technology with questions like

- Flow pattern in polyphase stirring units
- Modelling and optimisation of mixing processes
- Rheology, etc.

Bulk material and mixing technology with questions like

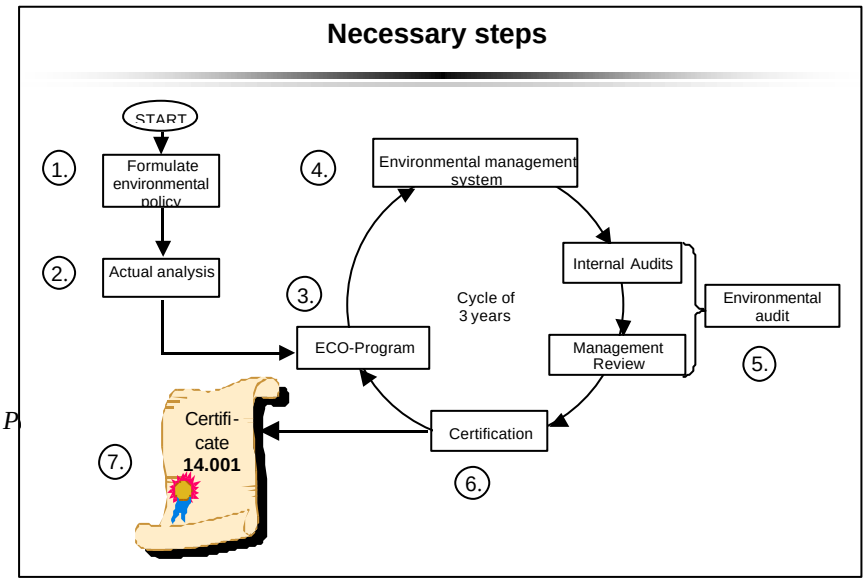
- High performance compaction
- Residence time and mixing quality in mixing units
- Vibrational mixing, etc.

Environmental Process Engineering is marked by these current projects:

- Residues in returnable bottles
- Anti-foaming
- Energy supply concept in Dubna, Russia
- Waste disposal technology in Indonesia
- Environmental Management for IT-producers and at universities, etc.

2. Steps for the Implementation of an Environmental Management System

The implementation of an environmental management system according to EN ISO 14001 requires the following steps:



P

1st step as philosophical basis:
Creation and passing of an environmental guideline

2nd step Survey of the status quo situation:
Environmental analysis in ecological aspects

3rd step Description of the need for action:
Course of action including single measures prioritised by urgency, a.o. to equalise the calls for action identified in the step before

4th step Documentation of structures and processes:
Written fixing of the management system with description of the structure as well as of the procedures in core processes and in supporting processes

5th step Evaluation of the chosen system by internal auditors:
Results of internal audits will be submitted to the management for evaluation

6th step Evaluation of the system by an external expert:
Do philosophy as well as strategic and operative actions correspond with the international valid norm DIN EN ISO 14001?

7th step Internal and external use and presentation of the certificate.

3. Environmental Policy as Ecological Guideline

Statements of the environmental policy are more philosophical. They show the direction of the environmental acting of an organisation. Environmental statements may be transferred to measurable targets in the following steps of implementation.

> *„... The aim of our programme is to improve our output, our quality and the protection of our employees. Negative effects for humans, for our environment and for the quality will be avoided by using the best available technology if it is justifiable economically.*
>
> *We teach these basics to our students so that they can work in their later positions in the same way by using founded specialised knowledge.*
>
> *The research tasks in the group environmental process engineering are contributions to the protection of our natural base of life. They are mostly application-oriented and produce visible environmental discharges...“*

For the implementation of environmental management systems, an environmental policy describes the general wishes of the management of an organization and the direction in which it should develop under ecological perspectives.

During a workshop at the specialised group "Process Engineering", brainstorming was initiated to gather elements for the ecological guidelines of the specialised group. Already available environmental methods from other universities were used as basis for discussion. Later on, the institution direction reviewed this proposal, which will additionally be discussed with all employees.

The discussion result was finally granted and came into force. The environmental policy was made public by presentation at the institute's conference, by publication on the intranet as well as on the black board. A suitable guideline serves as important factor for success of an environmental management system provided that it expresses the consciousness, conviction and the responsibility of the highest level of administration.

3. Analysis of the Ecological Situation

Target of the check is to detect strengths and weaknesses in environmental protection, in quality management and in the industrial safety.

The results of the analysis can be represented well by photos. Very often a photo refers directly to action requirements.

In addition, not only negative behaviour pattern should be addressed. The description of positive and "correct" behaviour concerning environmental protection will contribute to a stabilisation of the desired environmental behaviour.

Checklists are the bases for the actual analysis. It was orientated on the „...points of view to be treated at least", like those which are given in the EU-Eco-Audit-Regulation (Appendix I,Section C).

The results of the actual analysis are:

- a collection of the environmental effects of all tasks,
- a directory of all regulations and approval records,
- the consumption of energy (electricity, gas, etc.),
- data of the consumption of fresh water, of the disposal of waste water and of the amount of waste,
- the consideration of ecological aspects for the chose of new processes,
- the environmental friendly acting of orderers and suppliers,
- the avoidance and limitation of environmental harmful accidents,

- the environmental related information and education of the employees and
- the external information about ecological questions.

4. Environmental Protection Targets and Measures

Based on the deficits collected during the actual analysis, acting fields are defined on which can be worked environmentally discharged in the future. This future-orientated environmental programme is the heart of an environmental management system.
A controlling and executing equipment shall not be installed but a future-orientated help that supports the operational environmental protection.

The environmental programme was implemented with the aim that environmental protection measures of the employees would be supported. If such measures proceed only by commanding, the change of behaviour will not last for a long time. Short-term changes of behaviour result in limited ecological discharging effects.

5. Structures and Processes as Contents of the Management-Documentation

In the system, the function of an environmental protection representative is described. In other chapters of the operational environmental protection manual, all regulations, approval conditions and environmental relevant enclosures are collected, or the environmental protection controls are described. Finally, the instruments and tools which are used for the internal and external environmental protection communication are documented.

Due to frequent use forms like business trip applications, the employees are virtually "forced" to work with the management documentation daily. The obstacle potential using the manual to solve complex circumstances will decrease. The advantage of a computer-based documentation is the possibility to central and fast adaptations so a continuous actuality of the tool is guaranteed.

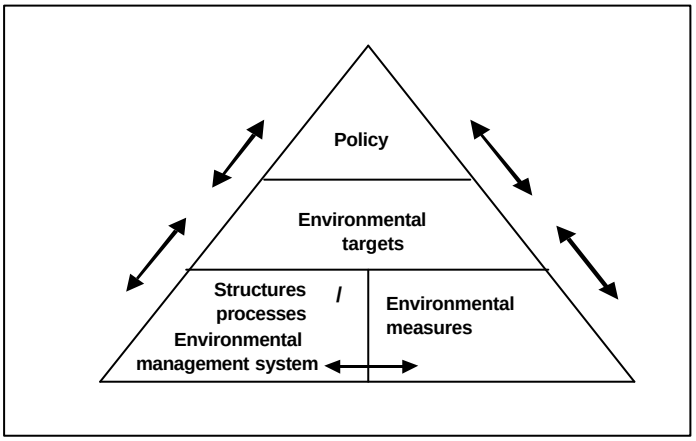
Further advantages of a data-processing-based documentation are:

- quick and daily access
- no paper needed (another ecological aspect)
- simple orientation due to a structured contents
- central modification office, which guarantees a continuous updating of the contents.

6. Internal Audits and Management Reviews

The structural and procedural specifications need to be checked. Are the aims of the environmental management system and the operational reality really equal? It is necessary to check whether the environmental policy may be go on by operable aims and measures and if the structures described are usable to influence the environmental targets positively.

A management system doesn't provide its complete use only because it has been certified. An external vote about a management system doesn't guarantee that its structural and procedural demands have been included into the daily work of all the employees. What is the reason for this? A certificate doesn't provide that the self-chosen structures and processes "live" in the organisation. This "living" seems to be the key for success. If quality should be raised and the use of the natural environment should be decreased at the same time, all employees must be included intensively
and durably into these processes. Employees will only accept long-termed changes of behaviour



if they can see the use of environmental friendly behaviour beyond their own workspace.

7. Benefits of a Certified Environmental Management System

The most important benefits for the university members are:

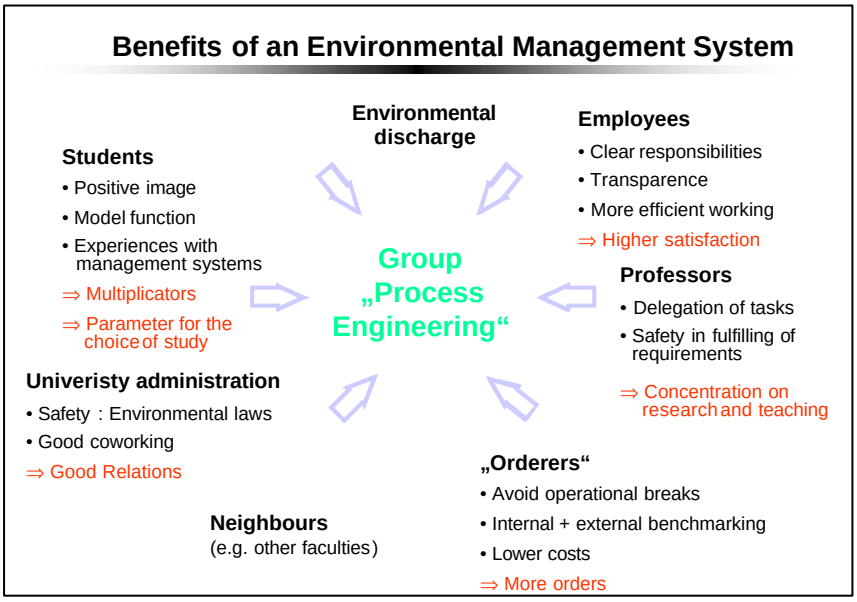
- A complete environmental management system, documented in an environmental protection manual, offers absolute **transparency**. Responsibilities and competencies are regulated clearly and completely.
- The **risk** of penalties and punishments can be reduced for the leadership by the transparency, the documentation and the routine check of specifications.

- The good relationship to the **authorities** will be stabilised by excluding irregularities caused by being uninformed.
- This effect of a **positive image** continues in the relationship to neighbours and environmental associations.
- **Costs can be reduced** because the output is produced more rational.
- **Motivated** employees say: "I like working in a environment-friendly university !"
- **Interested students** get an overview over implementing management systems which are requested in all enterprises in the sectors environmental protection, quality assurance, work safety, etc. today. Students are given opportunities to gain practical experiences in the developing and implementing process of management systems.

Up to now, the environmental management system of the specialised group "Process Engineering" has been certified according to DIN EN ISO 14001 and the quality management system according to DIN EN ISO 9001.

In future, it shall be tested whether a certification of the work safety contents according to SCC-Standard is useful. The experiences made in the work group were transferred to other areas of the university e.g. to the university administration which was also certified according to DIN EN ISO 14001 and to EMAS.

„Repairing", „after-ensuring" environmental protection should be replaced by „ensuring", integrated environmental protection. The external demands of the various target groups can be satisfied in that way.



Dr. Josef Noeke

University of Paderborn, FB 10, Environmental Process Engineering,
Warburger Str. 100, 33095 Paderborn, Germany
Tel. xx49 5251 602406, Fax xx49 5251 603207
E-mail: josef.noeke@vt.upb.de

Return to Contents

23. An integrated approach to Environmental Eucation: A Case Study

Prof N P du Preez

Technikon Pretoria, South Africa

INTRODUCTION

In 1989 the Post- Graduate School of Management (PSM) of the Potchefstroom University for Christian Higher Education introduced the subject Environmental Management into the curriculum for the PSM programme. This innovative approach was the result of inputs from the advisory board of the PSM, who questioned the relevance of the curriculum without environmental management as a component.

In 1994 the Director of the PSM was appointed as the Deputy Vice Chancellor (Academic) at Technikon Pretoria. Shortly after that, the Executive Management Committee (EMC) of Technikon Pretoria took a strategic decision to develop educational programmes in Environmental Management and Sustainable Development. The EMC also decided to use an integrated approach, including the development and implementation of an environmental management policy for Technikon Pretoria. This paper sets out, in the form of a case study, the project we embarked on. We share our experience in the development and implementation of the curriculum, research and development, management processes for sustainability, community service and national and international co-operation. The paper will detail our successes and failures, and the significant lessons that may be learnt from our experience.

The first step in the process was the appointment of a project leader, and although the Technikon offered programmes in Environmental Health and Nature Conservation, it was decided to appoint a person from outside the Technikon. In retrospect, this was a very wise decision. It was also important to appoint someone that had a passion for sustainable development and the environment.

From the above, two important principles in management are confirmed. The first is the importance of technological gatekeeping, since many innovations in an organisation have their origins outside the organisation or are brought into an organisation through new appointments. The second principle is the importance of a product champion in the success of product development and innovation. During 1999 and 2000, Technikon Pretoria developed more than twenty new degree programmes, and in all these cases there were passionate and committed product champions. However, in one instance we failed miserably because we did not appoint a project leader.

CURRICULUM DEVELOPMENT

The curriculum was developed from October 1994 to August 1995. It was the first curriculum in South Africa to include an undergraduate qualification. At that time, some universities were

already offering a Master's Degree in Environmental Management with entry requirements rooted mainly in the Natural Sciences.

The process started in October 1994 with an extensive literature study as well as preliminary discussions with a small group of prominent experts in the field of environmental management. From this study, a number of disciplines were identified to form a possible core for the curriculum.

During the latter part of 1994 and early in 1995, more than forty organisations and stakeholders were visited as part of a research project to develop the curriculum. The group included private companies such as Agricura, Pick & Pay, Samancor, Sasol, Sentrachem, Nissan SA, Gencor, Iscor, Sappi, Transvaal Sugar Limited, Shell and Mondi Paper. Discussions were also conducted with the Department of Environmental Affairs and other parastatals. The parastatals included City Councils, Eskom, the Council for Scientific and Industrial Research (CSIR), Lethabo Power Station and the Atomic Energy Board. Discussions with the Industrial Environmental Forum, a very powerful association comprising some of the top companies in South Africa, also played a significant role in the development of the curriculum.

During this process, valuable information was gathered regarding employment opportunities in the market, and the profile of environmental managers in industry, state and semi-state organisations. Most environmental practitioners had a background in Natural Sciences or Engineering, but there were also practitioners with nursing or other health related backgrounds. The survey also concluded that approximately sixty employment opportunities per year would become available in South Africa, inter alia corporate environmental manager, environmental management consultant, environmental technician, environmental auditor and environmental impact expert.

The curriculum that was finally approved by the Advisory Committee for Universities and Technikons (AUT) included the following subjects:

- Chemistry I, II and III, with the emphasis in year 2 and 3 on Environmental Chemistry.

- Environmental Ecology I, II, III and IV. These subjects include topics such as industrial ecology, general ecology, waste management, recycling techniques, risk management, climatic studies, environmental quality, environmental health and sustainable resource management.

- Environmental Management I, II, III and IV. The syllabi include introductory management aspects such as public relations, marketing, finance, production management, human resources management, organisational behaviour, and the strategic management from an environmental perspective. The more specific environmental aspects include life cycle analysis, environmental audits,

environmental impact analysis and sustainable development.

- Auxiliary subjects such as Communication Skills, Statistics, Computer Skills, Microbiology, Environmental Legislation, Environmental Biotechnology, Environmental Geology and Entrepreneurial Skills.

In the final year of the National Diploma, students did six months' experiential training in industry.

The Baccalaureus Technologiae (B Tech) degree included, over and above Environmental Management IV and Environmental Ecology IV, the compulsory subjects Research Methodology and an Environmental Technology project. Students could also select one of the following subjects: International Trade, Eco-tourism, Production Management, Marketing, or Environmental Rehabilitation.
Over the years the curriculum has been adapted to reflect trends in the external environment. The qualifications are now awarded in Environmental Sciences, and no longer in Environmental Management, while an option in Environmental Geology has been included. The new curriculum is shown in **Appendix I.**

One of the four pillars of Technikon Pretoria's strategy for the transfer of knowledge and technology, or our teaching and learning strategy, is vibrant partnerships. The development and adaptation of the curriculum over the last eight years has re- emphasised the crucial role of industry and other stakeholders in this process. Technikon Pretoria appointed an advisory committee in 1995 to assist us in this process and to ensure that the standards and quality of our programmes are in line with the expectations of industry. The following companies and other stakeholders had representatives on the first advisory committee:

- Eskom, Midrand
- Iscor, Vanderbijlpark
- Billiton, Johannesburg
- Ingwe Coal Mine
- Nissan SA, Rosslyn
- Department of Environmental Affairs and Tourism
- Agrihold.

FROM CURRICULUM DEVELOPMENT TO IMPLEMENTATION

Technikon programmes/qualifications are national programmes and are co-operatively curriculated. The Environmental Management curriculum was submitted for approval at a meeting of the Committee for Tutorial Matters (CTM) or Academic Committee of the Technikons in February 1995. The new degree was rejected by the CTM. The major reason for this was the fact that the concept was so new in South Africa that there was no one with real expertise at other technikons to evaluate the content. At some technikons it was evaluated by staff at the Civil Engineering Departments and at others by staff at the Environmental Health

Departments. The latter group was opposed to the new degree and saw it as a threat to the degree in Environmental Health, which was already being offered by a number of technikons in South Africa.

The period immediately after the February meeting was used to drum up support for the new degree. Meetings were held with the technikons who had rejected the proposed programme, with officials from the Department of Education, the Department of Environmental Affairs and the Industrial Environmental Forum (IEF), which was rated as a powerful association and a strong supporter of the new programme. By June 1995, more than ninety (90) per cent of the technikons supported the new programme, with only one of the strongest competitors still opposing the introduction of it. The curriculum was finally approved at the August meeting of the CTM, based on the notion of "sufficient consensus" in the policy of the technikons regarding the introduction of new programmes/qualifications.

In September 1995, the new qualifications was finally approved by the AUT. Shortly after that permission to offer the programme at Technikon Pretoria was obtained from the Department of Education. Many hours of hard work had finally came to fruition and the attention was now focussed on the planning and preparation for the first intake of students in January 1996. Since it was already late in the year, a special marketing campaign was launched to attract the right calibre of student for the new programme.

However, our elation was short lived. In October 1995, the DVC Academic of Technikon Pretoria was summoned to attend a meeting of the National Environmental Health Forum (NEHF) in Cape Town. The NEFH is an association of stakeholders who act as a national advisory body to the Environmental Health degree. The argument of the NEHF was that there was too much overlap between the two degrees and that a new process of curriculation should be undertaken. It was clear that they would be satisfied with a single curriculum for the first three years with the emphasis on environmental health and an elective in the final (fourth) year that could relate to environmental management. This view is supported by the fact that a letter from the Director General of the Department of Health to the Director-General of Education in May 1996 read as follows: "The overwhelming view supported by the National Environmental Health Forum (NEHF) is that there should be recurriculation of the two programmes such that the B Tech Environmental Health is strengthened, while the environmental Management Course is restructured for the Post-Graduate Diploma or Master's Diploma". It should also be mentioned that the NEHF has strong links with the Department of Health.

During the meeting in Cape Town, Technikon Pretoria maintained that there were sufficient differences between the two curricula, the stakeholders, the industries in which the students were going to work, the careers for which the students were being educated and the objectives of the two programmes. However, it was obvious to the delegation from Technikon Pretoria that the NEHF was not to be convinced. It was agreed that further discussions should be arranged in 1996. At this stage there was very strong resistance from our own academic department responsible for the Environmental Health programmes at Technikon Pretoria.

It therefore came as no surprise when the member of the Council of Technikon Pretoria who represented the Convocation at that stage, tried to obstruct the approval of Council for the introduction of the new programme. The member was an alumni of the Department of Environmental Health of Technikon Pretoria. However, Council rejected his proposal and the programme was approved by the internal structures in November 1995.

During 1996, as has already been mentioned, the Department of Health nevertheless proceeded with opposition at Governmental level to the introduction of the programme. Fortunately for Technikon Pretoria, both the Department of Education and Environmental Affairs were strongly in favour of the new programme. After May 1996, the resistance slowly petered out. Long discussions with the Technikon's Department of Environmental Health also brought about acceptance within the Technikon.

The programme was first offered in 1996 and the first cohort of students received their National Diplomas (a three-year qualification) at the graduation ceremony in 1999. In 2002, the first Master: Technologiae Environmental Management degree was awarded.
Up to the end of 1995, only the project leader and the supporter in the EMC (i.e. the Deputy Vice Chancellor: (Academic) was involved in the process of curriculation, planning and organising. In late 1995, both the Senate and the Council approved the creation of an academic Department for Environmental Management. At that point an interesting debate started on the placing of the department within the faculty structure of the technikon.

An analysis of the curriculum revealed that approximately thirty percent of the curriculum concerned economic management, thirty percent natural sciences while another thirty percent related to natural resources. The latter formed part of the curriculum of the Department of Nature Conservation within the Faculty of Agriculture and Nature Conservation. The newly created department was first offered to the Faculty of Economic Sciences who did not want to accommodate it. The Dean of Natural Sciences requested that the department should be located in his faculty, and the request was granted. The degree of success of the department over the last eight years can be directly ascribed to:

- the presence of a product champion;
- a staunch supporter with a passion for the environment in the Executive Management Committee of the Technikon; and
- the acceptance of the newly created department in the Faculty of Natural Sciences and the strong support of the Dean of that faculty.

RESEARCH AND DEVELOPMENT

During the early stages, emphasis was placed on teaching and learning, the marketing of the programme both within the technikon and externally, and on liaison with industry and other stakeholders. Research was limited to industrial projects.

During 1997 a substantial donation was received from industry, payable over three years. Part of the donation was used to obtain THRIP- funding for the development of an Environmental Management System (EMS) at one of the plants of the donor. A number of smaller projects were handled during the latter part of the nineties specifically for post-graduate students.

A merger with the Department of Geology in 2000 gave the research capacity in the department a substantial boost. During a departmental meeting held on 15 April 2002, the development of a research focus area in environmental technology was discussed. It was agreed that a suitable title for the research focus area would be APPLIED ENVIRONMENTAL TECHNOLOGY.

The focus will be on the development of the human resources in the Department of Environmental Sciences in terms of research capacity and research output, as well as the need to develop an integrated approach in environmental sciences and environmental management. It is the vision of this research focus area to develop expertise in the field of applied environmental technology. It is envisaged that this will be accomplished by developing human resources through research, training and education.

The aim of the applied environmental technology research focus area is to conduct research that can be applied in the implementation of integrated environmental management, and to manage data, information and knowledge of the relevant study fields. It is also the aim to develop a team of experts and a technology base in applied environmental technology.

Proposed themes and projects within the department are the following:

- **Geotechnology**
- The aim is to apply scientific methods and engineering principles to the exploration, use and management of natural resources, and to the acquisition and interpretation of crustal materials and processes to the solution and management of environmental, mining, geological, engineering and hydrogeological problems. The projects include: risk analysis of open-pit mine limits, groundwater quality in some parts of the Limpopo Province, and a study of a groundwater model at the Mispah Tailing Dam of Anglogold.

- **Biological Assessment and Biodiversity Management**

- **Land Use and Water Quality**
- The aim is to identify and categorize potential sources of pollutants, resulting in to assessment of the purity levels of natural waters and the extent to which they can support aquatic animal and plant species.

- **Waste Management**
- The aim is to explore the possible utilization of cost-effective waste materials in the recovery of precious metals. This project includes the recovery of precious metals from industrial,

agricultural and domestic effluents using maize and coconut husks, pineapple and banana peels, and water hyacinth.

- **Water Treatment**
- The aim is to develop a cost-effective method for the decontamination of water in the hope of destroying disease-carrying organisms. Projects include the decontamination of water using absorption and photocatalysis, and the removal of fluoride from drinking water using animal bones.

- **Impact of Air Pollution on Land Degradation**
- The aim is to determine the level of air pollutants particulates in order to assess the purity levels of air, soil and water.

These projects are a joint research project undertaken by a number of departments at Technikon Pretoria, including the Departments of Civil Engineering, Water Care, Environmental Sciences and Environmental Health.

INTERNATIONAL LIAISON

During 1999 the Head of the Environmental Sciences Department joined 21 international Higher Education institutions at the International Institute for Industrial Environmental Economics, University of Lund, Sweden for a training program regarding Cleaner Production. The program "Educate the educators" was the beginning of the effective communication and exchange of knowledge between these institutions. Some of the countries represented were New Zealand, Hungary, Baharain, Jordan, Egypt, Ethiopia, Zambia, India, China, Thailand, Brasilia, Mexico, Argentina and Poland.

Good co-operation also exists between our department and the Hoogeschool Ijselland. One of their lecturers visited and lectured at our department for two months during the first semester 2002. One of our lecturers visited their institution for three weeks during December 2001.

The co-operation programme established with the Brandenburg Technological University (BTU) is active and very successful. During 1999 a total of thirteen international tertiary educational institutions held a workshop in Cottbus, Germany at the BTU to establish a student exchange programme. The BTU offers an International Environmental Resource and Management programme. The programme includes a semester abroad. Technikon Pretoria and Egypt sent the only representatives from the African continent. Other countries included Poland, Russia, the Czech Republic, the United Kingdom, France, Mexico, Brasilia, Argentina, Germany, China, and India.

Our department had three students from the BTU during the second semester of 2000 as well as three students in 2001. We hope to be able to send the first three of our students to Cottbus during 2003.

COMMUNITY SERVICE

Community service projects are conducted jointly by the Departments of Nature Conservation, Environmental Sciences as well as Departments from the Faculty of Arts. It is our endeavour to develop environmentally aware students and learners at schools. They are, after all, our future generation. The main purpose is to develop a deep and lasting concern for the environment and for sustainable development in our future generation. These projects are part of a well-planned and implemented environmental-awareness programme. Since 2000, World Environmental Day has been celebrated by Technikon Pretoria as a joint venture of the whole organisation.

The Department of Nature Conservation has adopted thirty schools throughout Pretoria. Our senior Nature Conservation students are involved. This forms part of their training programme. These are "hands-on" programmes and active participation is the key element. The schools range from private schools to disadvantaged schools. We also present environmental programmes to schools and organisations which cater for those with disabilities - from hearing, to sight-impaired as well as to the physically challenged. This is not an one-off programme because all the schools and organisations get a minimum of twenty visits per year. These visits encourage the use of curriculum 2005, as well as other environmental issues. We create an "outdoor classroom". Children learn whilst having fun!

Our primary school learners and our students have entered the world at a point in history when many nations are radically reassessing their utilization of natural resources and the role of citizens in managing the environment. Only through direct participation can they begin to develop a genuine appreciation of democracy and a sense of their own worth and responsibility.

Technikon Pretoria is not only active in our province but has introduced this environmental awareness programme into Kwa-Zulu Natal. The Ndumu and Ingwavuma communities have also been set on a path towards achieving a positive environmental change. It has been an amazing challenge to them as well as to us. Despite the language barrier we are challenged to learn more about Zulu traditions. Once again we are involved in changing attitudes and perceptions towards their natural environment. Eight schools are involved in the programmes. We have a full time B.Tech student involved in this awareness programme. Signs of success are evident.

Another interesting development was the creation of an Environmental Law and Management Clinic (ELMC) within the Department of Environmental Sciences. This is an advisory office which has been accredited by the Law Society of the Northern Provinces. The ELMC offers specialist environmental, legal and management services to people who cannot afford to pay for the services of an environmental consultant or an environmental attorney. The criteria of the Legal Aid Board are used to assess which clients will qualify for assistance by the ELMC. Students of the Department are involved in advising on and drafting environmental impact reports and environmental impact assessments, attending public participation meetings and reviewing public participation projects on behalf of clients, advising on environmental litigation,

advising on the forming of voluntary associations and any other tasks provided they fall within the ambit of the ELMC. A member of staff who is a qualified attorney, co-ordinates the activities of the students.

This is the second year that the ELMC has been in operation. The Clinic has been very active in assisting several clients, such as the Wildlife and Environment Society of South Africa, some (voluntary) land owners' associations, as well as some individual clients. The ELMC has also participated in an international research project on the implementation of Principle 10 of the Rio Declaration.

THE ROLE OF THE EXECUTIVE MANAGEMENT COMMITTEE (EMC)

The ongoing support of the EMC has been essential to the success of the departments at Technikon Pretoria that are involved in environmental programmes, and more specifically, the Department of Environmental Sciences.

In 1998, the EMC included the caring principle or philosophy as one of our values in the mission of the Technikon. This value states that: Caring – to make a difference through being actively involved with other people in the institution and in the environment.

In 2001, a new programme in Eco-tourism was introduced. This programme is offered jointly by the Departments of Tourism Management and Nature Conservation. Our MBA-programme includes an environmental management component.

And last, but not least, we are currently developing a module in environmental management that will be included in virtually all our degree programmes.

APPENDIX I

CURRENT CURRICULUM OF THE BACCALAUREUS TECHNOLOGIAE: ENVIRONMENTAL SCIENCES

INSTRUCTIONAL OFFERING/COURSES: FIRST DEGREE

Entrepreneurial Skills
Environmental Management I
Computer Skills I
Communication Skills I
Applied Geology I
Chemistry I
Environmental Resources I
Geology I
Geotechnology I
Microbiology I
Mathematics I
Environmental Management II
Environmental Management Systems
Environmental Legislation
Applied Geology II
Environmental Biotechnology II
Environmental Chemistry II
Environmental Geology II
Environmental Resources II
Geotechnology II
Environmental Economics
Environmental Management III
Industrial Processes III
Environmental Chemistry III
Environmental Geohydrology III
Environmental Geology III
Environmental Resources III
Geotechnology III
Industrial Environmental Practice III

Remarks

Optional Instructional Offerings:
Two of the following:

Environmental Chemistry III	Industrial Processes III
Environmental Geology III	Geotechnology II

INSTRUCTIONAL OFFERINGS/COURSES: B TECH DEGREE

Environmental Social Science II
Project: Environmental Technology IV
Environmental Management IV
Environmental Rehabilitation IV
Integrated Catchment Management IV
Water Quality Management IV
Environmental Chemistry IV
Environmental Geohydrology IV
Environmental Geology IV
Environmental Resources IV
Geotechnology IV

Remarks

1. Compulsory Instructional Offerings:
   Project: Environmental Technology IV

2. Optional Instructional Offerings:
   Four of the following:

Environmental Management IV	Environmental Resources IV
Environmental Rehabilitation IV	Environmental Chemistry IV
Water Quality Management IV	Environmental Geohydrology IV
Integrated Catchment Management IV	Geotechnology IV
Environmental Social Science III	Environmental Geology IV

3. This instructional programme replaces the Baccalareus Technologiae:
   Environmental Management

PROF N P DU PREEZ
DEPUTY VICE-CHANCELLOR (ACADEMIC)
TECHNIKON PRETORIA
PRIVATE BAG X680
PRETORIA
0001

TELEPHONE NO: 27 12 318-5428
FAX NO: 27 12 3184115

Nico@techpta.ac.za

Return to Contents

25. Value-education in sustainable development: enhancing competences of intuition, reflection and communication

Dr. Heidi Muijen

Vrije Universiteit of Amsterdam', The Netherlands

Abstract
Despite the main stream rationalistic approach of science in academic curricula with a focus on specialization, the Dutch history of higher education shows an interesting example of an alternative development. The 'Vrije Universiteit of Amsterdam' (VU) has declared in her mission statement a pedagogical ideal of 'broad academic education', oriented towards *moral responsible and reflective* scientists and professionals'. The (re)orientation of the curriculum towards philosophical reflection and responsibility has contributed to the rehabilitation of (ethical) values and a broad scope in the core of scientific and educational activities. A pilot study shows us how this pedagogical view on value education is operationalized by a learning model (Dilemma Oriented Learning Model) in the context of a sustainable development course in the earth and life sciences. The first results of our research on this newly developed course indicate that students need more insight into the statute of (moral) values in relation to empirical facts, (methodo)logical norms and (inter)national conventions. The question of value education is not just interesting in philosophical terms, but as an educational assignment, encompassing cognitive, emotional and interactive competences of students. The first research findings indicate more specifically a need for value education along the route of enhancing competences of intuitive awareness, philosophical reflection and dialogical communication on issues of values.

The development of value education presents us an interesting counter example of the common sense notion that issues of values are a subjective matter, subjected to irrational forces like rhetorical debate and political choice. When this route of developing scientific curricula containing aspects of value education turns out to be succesful, the idea of an intuitive faculty as a way of *becoming aware of values* can be taken up again. Thereby a onesided track within Western Rationalism could be complemented with a counterbalancing approach based on an empathetic relation to the world derived form the philosophical Romantic tradition. To avoid the pitfall of intuitionism or irrationalism and in order to add cognitive and communicative competences to the intuitive faculty a dialogical perspective on value education is outlined.

Keywords : value education, dialogical communication, intuition, philosophical reflection, sustainable development in curricula, pedagogical mission.

Paper
In this paper I will present a philosophical outline of a programm for enriching academic curricula for the purpose of value education. The 'Vrije Universiteit of Amsterdam' (VU) has declared as her mission statement a pedagogical ideal of education so that students will be trained as becoming scientists and professionals with a 'moral responsible', a 'generalist' and a 'critical' attitude. This educational programm comes up to a (re)orientation of the academic curriculum towards philosophical reflection on theoretical presuppositions, including

reflection on moral and other values. As such this programm - which is called 'On values' - contributes to the rehabilitation of (moral) values in the core of scientific and educational activities. A parallel educational programm is called 'Sustainable Development' and focusses on the integration of value communication and knowledge about sustainability issues. In the former presentation Geertje Appel has described the organizational context and the dynamics of change of these two parallel programmes for curricula development of the 'Vrije Universiteit' of Amsterdam. I will focuss on the philosophical conditions for these programmes as organizational instruments for curriculum development. First I consider the question what the concept of value education presupposes. Then I enrich this philosophical outline with an analysis of a specially designed course for the life and earth sciences on 'sustainability in food supply', developed by Marijke van Langen, Nico van Straalen and Geertje Appel.

Introduction: the historical and philosophical setting of our educational programmes
The concept of value education is embedded in a long philosophical tradition, starting from the Greek concept of 'paedeia' (from which our word 'pedagogy' stems) and culminating in the Enlightenment idea(l) of a systematic improvement of our rational faculties, leading to the (moral, cognitive and technical) development of the individual and of society as a whole. As such the concept of value education is part and parcel of a broader conception of 'cultural' development. The original Enlightenment idea can be seen as a re-interpretation of the 'paedeia'- idea and Greek 'wholistic' approach: the development of the human being as a process of developing our rational capacities that inherently includes being 'cultural', 'political' and 'spiritual'. The Greek heritage and Enlightenment re-interpretation have been transformed into the German conception of *Bilding*, articulated by Wilhelm von Humboldt as the ideal of a 'free university'. 'Free' in this context means 'free from economical or utilitarian principles', thereby generating a 'free academic atmosphere' for the purpose of 'liberal education'. This Romantic concept of 'Bilding' was aimed at an integrative development of the sciences, the humanities and the arts. From a historical and philosophical point of view this 'wholisitic' perspective counterbalances an onesided aspect of the Enlightenment ideal. Meaning a rehabilitation of our 'non-rational' faculties like the intuition and imagination. According to the rationalistic view our rational faculties were privileged and our moral, intuitive and creative competencies were seen as derivative. An example is Kants philosophy in which he articulates the threefold way in which our Reason operates in theoretical, practical and esthetic matters. This Rationalistic conception of development and education was thus broadened by the Romantic idea of 'Bildung' aimaing at a mutual development of both the individual human being and of society as a whole. This Romantic programm can be tracked along the tradition of Idealism with philosophers like Schelling, Goethe, Herder, Hegel and Von Humboldt. The idea of such a broad education was not just confined to the continent but was also formulated much earlier within the Anglo Saxon tradition by Francis Bacon for example. He visualized his view as an Utopia, an ideal society on an imagined island that had realized a reform of science, turning it into a generalist, human and empiricist approach for the benefit of mankind. His ideas resulted in the foundation of the "Royal Society", the first society for scientists. Maybe it is an irony of history that this ideal of 'liberal education' has been gradually impoverished on the continent and has been transported to the West and implemented in some prestigeous universities of the United States. Now most Dutch universities suffer from a (too) narrow scope and a specialistic orientation towards the utility of knowledge for (technical) applications.

Today the word *Bildung* rings an old fashioned Romantic bell and seems to have historical value only in the context of post-modern relativism and the hegemony of 'economical thinking' in nearly all sectors of society. This type of thinking is articulated philosophically by e.g. Heidegger. Habermas elaborated on its consequences in society in terms of 'the colonization' of our 'private world' by the political and economical subsystems. From a rationalistic and relativistic perspective our cultural well being is seen as being manipulative by means of political manipulations and ultimately being derivative of socio -economic factors. Consequently questions of mental, spiritual and moral development are articulated in a materialistic and economically oriented discourse. We talk about the 'human *capital'* of our organizations and we see universities as 'business enterprises', expecting them to generate *pro fitable* 'educational products'. This implies that academic curricula and developmental programms for improving the *'output'* of our universities are dictated by economical thinking. On a macro scale of social well fare we invest in our 'human capital' by 'p roducing' more and more specialized academic professionals. Besides money our specialists rule the world. Our government sanctions universities financially according to the rates by which they maximize their output of scientific products. Facing the social and ecological consequences in terms of our threatenend cultural and natural recourses we question now seriously whether these quantitative/ economically interpreted standards guarantee a quality test for our 'academic output'.

My philosophical hypothes is is: given this cultural and historical context the educational programmas 'On Values' and 'Sustainable Development' of the 'Free University' of Amsterdam can be seen as a 'cultural attempt' to pull the historical dynamics into another direction. That is : to measure the 'quality' of our 'educational system' in 'qualitative terms': in terms of the basic values of our pedagogical ideal of educating students into *reflective and responsible* scientists and professionals. The integration of our educational prog rammes 'On values' and 'Sustainable Development' into the academic curriculum is a consequence of this pedagogical ideal.

A philosophic-didactical design for value education
Geertje Appel has described in her paper social and organizational factors which proved to be necessary for a succesful implementation of these educational programmes into the different departments of our university. Now I will interpret these programms as a philosophic-didactical design, focussing on value education. My question is: What are essential preconditions for these programmes in philosophic-didactical terms? In what way can these educational programmes be interpreted as a counter example for the main stream rationalistic approach of science in our universities, i.e. the rationalization of our educational system based on the hegemony of economical thinking?

The operationalization of the pedagogical mission statement of the 'Vrije Universiteit of Amsterdam' by means of these educational programmes comes up to an re-orientation of the curriculum towards philosophical reflection and moral responsibility. The integration of the programmes 'On values' and 'Sustainable Development' into the disciplinary courses contributes to the rehabilitation of reflection and (moral) values in the core of scientific and professional activities. The aim is that hereby the application of scientific knowledge will be understood by students as more than just a 'technical question', an intellectual competence to use your academic toolkit in the right way. The question is: *What is the right way*? The 'right way' is interpreted as a moral and social question more than a 'technical recepe': Wat

conditions have to be met for this criterion of being *right*? Whereby 'right' includes reflection on social, moral, spiritual and ecological consequences of a technical intervention by a team of professionals. For example, referring to the pilot study (i.e. the course on sustainability in food supply), what are the social, moral, spiritual and ecological consequences of the technical improvement of a traditionally organized agriculture in an African country for the sake of food supply security for future generations? This question along with other questions and options was specially designed to integrate value education and knowledge concerning sustainable development into a third grade students course for the life and earth sciences. In the next part of this paper I will present an analysis of this course, focussing on one educational target of this course, namely the integration of value communication about sustainability issues. First a introductory word about the two programmes from a philosophical point of view.

The parallel programmes 'Sustainable Development' and 'On Values' are interrelated. On the one hand 'Sustainable Development' seems to be a specification of a more general and basic shift towards (moral) values and philosphical reflection in the core of scientific and professional activities. That is: the integration of a value perspective in the generation, application and transmission of scientific knowledge is specified into matters concerning sustainable development. The application of scientific and technical knowledge is enriched with reflection on the social, ecological and moral consequences as well as with reflection on the social dynamics of political and organizational decision making processes. On the other hand the programme 'Sustainable Development' reflects a more profound level, a (counter) dynamics of the process of modernization and rationalization, being the very historical 'raison d'etre' of developing educational programmes like 'Sustainable Development' and 'On Values'. As such 'sustainable development' represents a general concern about the way our society is shaped by these historical developments and articulates a basic value that will be lost when the course of history will be determined by the processes of modernization and rationalization alone. This basic value inherent in sustainable development programmes concerns the onesided rationalistic way the 'globalized' but 'protective' economical system handles our cultural and natural recourses by dominating the sphere of production and consumption on a macro scale as well as on smaller scales like 'responsible entrepeneurship'. From this historical point of view the educational programm 'On Values' concretizes this more basic and general concern for 'sustainable development' as a human/ christian/ ecological answer for the 'systematic devaluation and economization' of our valuable natural and cultural resources. The programm 'On Values' is a possible translation of this basic concern into the many disciplinary fields of the sciences, focussing on value education. In either way the interconnectedness between the two programmes of 'value education' and 'sustainable development' is interpreted as the re-integration of a value perspective that generates a counter dynamics into the historial processes of rationalization and modernization, preventing the ultimate total annihilation of values. The educational programmes would stimulate ideally spoken in a 're-valuation of our world'.

The concept of value education

Starting from this general and fundamental level - what I have called the historical and philosophical setting of the two educational programmes - I will focuss now on some specific and essential ingredients for a philosophic-didactical design for value education. This notion of 'value education' presupposes what is traditionally called 'a moral faculty' that can be subjected to 'moral education'. To avoid the pitfall of intuitionism or irrationalism (routes of

an 'unrealistic romanticism') I will enrich this philosphical blue print with a 'pragmatic' shift (called a dialogical perspective) and some empirical findings gained from this pilot study, the analysis of the course on 'sustainability in food supply'.

My point of departure is the Romantic idea that we, as human beings, are capable of having an empathetic relation to the world and an intuitive faculty that enables us to become aware of this 'inner relation' we have towards 'being'. By introducing this Romantic idea into our educational programmes we are able to complement the above mentioned onesided track in the Enlightenment ideal of development: namely the prioritizing of our rational faculties above emotional, social, imaginative and intuitive competences. I take the development of these 'non-rational' faculties as a necessary supplement of the project of Enlightenment by 'emancipating' them as autonomous competences of 'social en emotional intelligence', of the intuition and the imagination. Hereby we broaden the concept of 'development' and 'education' similar to the old sense of 'Bildung', interpreting the human being as a whole person of heart, body and mind; as a being that is inherently linked with other beings and with the world and with 'being in general'. With our intuitive, imaginative and emotional faculties we can become aware of this inner connection with being 'which is allready there' before our conceptualizations, the phenomenological given, striking us with a 'directness', experience with a pre-conceptual quality' so to speak.

Our educational programmes are thus oriented towards cultivating an open mind and heart. This openness in the sense of a 'intuitive'or 'preconceptual awareness' is the (philosophical) precondition of our 'normal mode' of conceptualizing the world. This re-orientation introduces 'the other side of the coin' of our continuous conceptualizing mental activity. Normally we see and act from a paradigmatic view and with conceptual schemes instrumentally designed for our goals and targets, like the scheme of being a professional, of being a citizen, of being a mother, etc. 'Normally' we cannot see 'brutal facts' but we become aware of 'interpreted' reality. Truth is not 'naked' (as Nietzsche put it) but 'dressed' in *conceptual* 'clothes'. By cultivating 'openness' of mind and heart, we are able to see 'reality' as it is: indeed that it is conceptually framed by our continuous activity of conceptual framing. One aim of our educational programmes seen from a philosophical perspective would be: the cultivation of our 'intuition' as a sense of becoming aware of a 'preconceptual touch' of reality and of our mental activity of conceptualizing the world. This notion of 'a preconceptual touch' points to a phenomenological approach, interpreted as a systematization of this 'primal touch'. The epistemological and methodological problem however is that as soon as we express this 'preconceptual touch' in words we 'loose' this 'primal experiential quality'. The verbalization of this 'peconceptual touch' results in the transformation of our 'intuitive-physical awareness of being' into 'feelings', 'thoughts', 'events', 'facts', 'relations', fitting the conceptual frameworks by which we interpret our world.

This inevitable aspect of our mental activity, our mode of conceptualizing the 'preconceptual awareness', constitutes a second 'track' in our educational programm for value education. Refining our conceptual frameworks is a necessary complement of the 'moral education' or cultivation of our intuitive, imaginative and emotional faculties. These two routes presuppose:

1) to become aware of the (pre)conceptual nature of 'the phenomenological given', of our world of experience
2) to clarify our world of experience as a 'product'of a double, perceptual and conceptual way in which we interpret our world of experience. To become aware of 'perspectivism'

(Nietsche) and the 'fundamental otherness' in the phenomenological given, or the 'infinite possible way's/ perspectives or point of views ,- including ethical and spiritual perspectives as way's in which we structure our world.

3) to refine and scrutinize the conceptual frameworks by which we interpret our world of experience as they are transmitted by the community of scientists and professionals.

This philosophic-didactical design for our educational programmes is thus aiming at the development of a 'moral' or 'intuitive sense' in order to get a feeling for moral and religious questions relating to (the application of) scientific knowledge. As well as the development of an 'ethical framework', especially in relation to questions of sustainable development and of values in regard to the application of scientific knowledge. Most important however in order to attain these educational targets is the cultivation of a combined intuitive-conceptual and *dialogical* approach of value education. This implies, in a philosophical sense, a preventive therapy against intuitionism and irrationalism, thus constituting the most fundamental 'philosophical precondition' for our educational programmes. The dialogical approach creates a context for the 'systematic deconstruction' of our common sense notions and disciplinary frameworks which is a preliminary requirement for value education. Value education can only be realized when the cultivation of intuitive awareness is systematically linked to a context of communication. In a context of dialogical communication our 'vague' and 'equivocal' intuitions are expressed and tested by finding words, metaphors or other (non)verbal expressions which convey the 'preconceptual awareness' of 'meaningfulness' of our world of experience, including values. Therefor, crucial for the testing of intuitions and vague notions is this context of communication with others.

So the philosophic-didactical design aims at the linking of intuitive awareness to conceptualization by means of dialogue: first the dialogue within oneself, cultivating the open and critical awareness of our (pre)conceptual relation to the world; second the systematic 'falsification' procedure to verbalize and communicate these intuitions and preconceptual awareness and common sense notions in the context of group discussions, presentations, educational models and didactical frameworks.

Some empirical findings

In the last part of my paper I will concretize this philosophic-didactical design with some empirical findings. My analysis of the results of the before mentioned course on 'sustainable food supply' indicate that the academic curriculum can be improved by means of the three 'tracks' of the 'philosophic-didatical design', elaborated in the former section.

The results show first of all that 'values' are generally seen by students as 'subjective exclamations' instead of 'inter' or 'trans'-subjective 'value intuitions' which can be subjected to communicative testing. Subjective 'exclamations are of an emotional and irrational nature which are not open for dialogue and testing but will lead to discussion and convincing the other that you are right and the other is wrong. Dialogue presupposes openness of mind and heart for your own intuitive awareness as well as for different points of view that will be expressed by others in the dialogue. Instead of perceivingthese other points of view as threatening your own 'truth' the 'dialogical attitude' perceives it as a possibility to sharpen or transform or enrich your own point of view. Rob Boschhuizen who developed the DilemmaOriented Learning model for value communication will focuss in his paper on three different kinds of learning processes.

A second aim suggested by these empirical findings is a possible educational improvement in terms of the refinement of the 'colloquial language' in which most students express their 'subjective value interpretations', refining it into a more scrutinized conceptual framework for the purpose of value communication. This could be realized by offering students a philosophical/ ethical perspective on the issue of 'sustainable development' and related subjects of the disciplinary fields.

Far most important and difficult is a third aim which is preliminary for the other educational targets. This third aim is the cultivation of a general 'moral' sense founding the ethical/ philosophical perspective on the issue as such. Creating a feeling for the way in which this perspective differs from a disciplinary approach of the subject. Disciplinary perspectives on the issue of 'sustainability in food supply' offer scientific and practical knowledge about the way in which food supply in the context of a poor African country could be reorganized on a sustainable basis. One option for example is the introduction of high-tech agricultural innovations, like gen-modification; another option could be implementing an educational programm to improve the social and working conditions of the local community. These options have different ecological, moral and social effects on the people involved and on the natural and cultural surroundings. In this course students had to choose between 8 different options and justify their choice in terms of scientific know how regarding the effects, but also in philosophical and ethical terms. Weighing these options against each other is not just a scientific technical question about balancing the positive against the negative social and ecological effects of the different options. Ultimately it implies a choice between different value systems that accompany the choice and its effects. That is: it is ultimately a choice between different way's in which a community conceptualizes and values human beings in relation to each other, to the cultural and natural surroundings and in relation to a spiritual or religious dimension. When students would get a feeling for these value aspects that are ultimately inherent in professional choices and acting the main target of value education would be obtained.

(*Examples of these empirical findings will be put on sheets)*

My conclusion is that obtaining these three targets may be a rather high expectation but my hope is that we will be able to translate these tracks of the philosophical didactic blue print into educational routes somehow in a pragmatic way; thus modestly contributing to 1) cultivating intuitive awareness
2) refining and scrutinizing conceptual frameworks and
3) testing intuitions and concepts in a context of verbalization and communication.

Return to Contents

26. Environmental certification (ISO 14001) of Mälardalen University

Kristina von Oelreich

Mälardalen University, Västerås, Sweden

Key words: Sustainable development, environmental management system, ISO 14001, education and research, Agenda 21, environmental work

Summary

The aim of this paper is to describe how the concept of sustainable development—with a focus on the ecological dimension—can be applied practically in an organisation for higher education and research.

The organisation that will be used as an example is Mälardalen University (Mdh) in Västerås, Sweden, which has been environmentally certified since April 1999 according to the international standard ISO 14001.

The method encompasses literature studies and conclusions from practical experience in implementing and maintaining the environmental management system at Mdh.

The paper begins with a review of the concept of sustainable development based on the report "Our common future", presented by the World Commission on Environment and Development in 1987.

Agenda 21—the document from the Rio Conference in 1992—will be briefly summarised. Among other things, Agenda 21 emphasises that three dimensions of social progress, the social, the economic, and the ecological, must work together if progress is to be sustainable. The Agenda also argues that sustainable development is everyone's responsibility. Next will be a description of the sector principle, which has been adopted in Sweden by its Riksdag (the Swedish Parliament) and government and which states that the leading representatives in society—from organisations and firms to individual persons, including the public authorities—have a responsibility to contribute to a development that is sustainable.

European, regional, and national strategies for a sustainable development within the bounds of higher education and research will then be reviewed, followed by a report of the University's work to translate these strategies into practice. The report describes the University's work to integrate the environmental management system in the existing organisation within the bounds of education and research and daily operations.

Conclusions drawn from experiences in the introduction and maintenance of the University's environmental management system are, among other things, that:

- The definition of sustainable development is still unclear and leaves room for individual interpretations; each organisation in society must therefore develop their own competence to be able to govern correctly and make well-thought-out decisions.

- Consideration must be taken to the complexity of the questions and how different economic, social, administrative, and cultural conditions affect the implementation of a task on different levels in society. It is therefore important to continue to discuss the concept to find a definition that makes it more practicable on an organisation level.

- Sustainable development is not a static condition but a dynamic process where all participants in society must be involved. Since the surrounding world continually changes, goals and funding must also be developed continuously.

- The systematic and structured methods of the environmental management system can also be applied to the social and economic issues associated with the concept of sustainable development, thus creating a common management system for managing these issues. The purpose is to further the organisation's work toward continual improvement and thereby sustainable development.

Introduction

In light of reports on the continuing environmental damage, the General Assembly of the United Nations decided in 1985 to appoint a Commission on Environment and Development. The Commission was mandated to investigate the state of the environment in the world. In 1987 the commission presented a report (Our common future), which identified insupportable production and consumption patterns—primarily in the industrialised countries—as the main cause of global environmental damage.

To reverse this negative development in the environmental field, the Commission felt that environmental issues must be dealt with in a larger context, namely, together with economic and social development processes, to promote a *sustainable development* in all countries.

During the 1990s, a broad consensus developed that sustainable development ought to be the general guideline for social progress. Agreement is widespread, among both nations and political parties. At the same time, the definition of *sustainable development* is unclear and leaves room for different interpretations.

In Sweden, Riksdag (the Swedish Parliament) and the government have established the principle that each sector of society is responsible for sustainable development, the so-called sector principle. This principle implies that all representatives of society, from organisations and firms to each individual to the public authorities, have a responsibility to assist in a sustainable development, to observe social, economic, and ecologic dimensions simultaneously (Miljövårdsberedningens rapport 1996:2, Miljöarbete i statliga myndigheter [The Swedish Environmental Advisory Council, report 1996:2, Environmental efforts by governmental authorities]).

Changing direction towards a sustainable development can also be achieved by means other than legislation. Each organisation in society must instead develop their own competence to be able to govern correctly and make well-thought-out decisions.

The aim of this essay is to describe how the concept of sustainable development—with a focus on the ecological dimension—can be applied practically in an organisation for higher education and research. The organisation that is described is Mälardalen University (Mdh) in Västerås, Sweden, and has been environmentally certified since April 1999 according to the international standard for environmental management ISO 14001.

The method encompasses literature studies and conclusions from personal experience in implementing and maintaining the environmental management system at Mdh. The report begins with a summary of the concept of sustainable development described in “Our Common Future”, which the World Commission on Environment and Development presented in 1987. Subsequently, the contents of Agenda 21—the document from the Rio conference in 1992—are briefly presented. The sector principle, which was established in Sweden by its Riksdag and government, is also described.

European, regional, and national strategies for a sustainable development within the bounds of higher education and research will then be reviewed. A report of the University’s work to translate these strategies into practice then follows. The report describes the University’s work

to integrate the environmental management system in the existing organisation in training and research activities and daily operations.

The concept *sustainable development*

The World Commission on Environment and Development presented a report in 1987 (Our common future) where the concept *sustainable development* was discussed. The concept was defined in the report as follows:

> "a development that fulfils today's needs without endangering the ability of coming generations to meet their needs".

Such a development entails a more equitable distribution of the earth's resources and the insight that the earth's resources are limited.

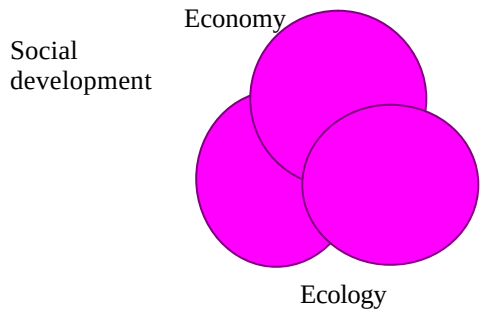
In their report, the Commission proposed that the General Assembly of the UN enact a plan of action for enduring sustainable development and consider the need for regional and international conferences. The General Assembly decided in 1989 to convene a conference on environment and development. The goal of the conference was to promote a sustainable development in all countries. The conference was held in 1992 in Rio and resulted, among others, in the following documents:

- The Rio Declaration on Environment and Development
- The Framework Convention on Climate Change
- The Statement of Principles for the Sustainable Management of Forests
- The Convention on Biological Diversity
- Agenda 21

The Agenda 21 document

The Agenda 21 document is a plan of action for the 21st century. The document discusses three dimensions of social progress that must work together if development is to be sustainable: the social, the economic, and the ecologic.

The three dimensions of sustainable development



The social, economic, and ecological dimensions in the concept of sustainable development are not mutually exclusive in the long term. Ideally, measures that promote more than one of these aspects and return double the profit are prioritised (SOU 1997: 105 The Swedish Ministry of the Environment).
It is natural that the three dimensions social, ecological, and economic are emphasised to different degrees at different times and in different parts of the world. For example, it is natural that industrialised countries with high levels of both resource consumption and environmental pollution emphasise the ecological aspect. Industrialised countries have a special responsibility here, to be leaders in the development of, for example environmentally adapted technology and resource efficiency (SOU 1997: 105).

In Sweden, the concept of sustainable development is often equated with environmental efforts. This is because social and economic dimensions have long been emphasised in politics and societal development while ecological concerns have had a lower priority.

A growing insight into global environmental problems and the association between environmental and developmental issues, however, has brought special attention to ecological concerns. At the same time, social problems such as unemployment and social segregation are growing throughout Europe. One of the great challenges of the future will therefore be to develop solutions that deal with more than one of these problems at the same time (SOU 1997: 105).

Comment: deal with

Agenda 21 also lists measures that focus on sustainable development in a wide variety of social areas, among others, in training and research. These areas are discussed in Chapter 35, ”Research for a sustainable development”, and Chapter 36, "To promote education and raise general awareness”.

The European strategy for sustainable development

In December 1999 at the summit meeting in Helsinki, the European Commission was mandated to develop a strategy for sustainable development. The strategy was presented at the meeting of the European Council in Göteborg, Sweden, in June 2001. The document focused on six problem areas that have serious consequences for Europe. These are:

- Climate change
- Threats to public health
- Increased pressure on vital natural resources
- Poverty and social casualties
- The ageing population
- Traffic-related pollution

According to the strategy, many of these problems share a common origin. Knowledge concerning the consequences of these problems and the alternatives is insufficient. More extensive knowledge is needed to understand what factors affect the different problem areas. One particular section in the strategy deals with the role of research and education in sustainable development.

Comment: Knowledge concerning

The Swedish strategy for sustainable development

At the Rio conference, the UN's member states pledged to have national strategies for sustainable development completed by the end of 2002. The Swedish government delivered its proposal for a national strategy for sustainable development to Riksdag in March 2002. The strategy not only summarised current progress but also considered the future for a sustainable societal development in Sweden. According to the strategy, sustainable development is the underlying goal in government policy and concerns all areas of politics. The concept *sustainable development* embraces all the dimensions—ecological, social, and economic.

Comment: underlying?

The proposal presents a number of principal strategic areas which the government considers significant in continued efforts for a sustainable development. These are, among other things, environmental efforts and work on issues concerning climate, public health and quality of life, working life, employment, economic growth, and welfare. The paper also describes how the government intends to evaluate and follow up progress in carrying out the strategy. An initial assessment will be made in 2003 after the conclusion of the world summit to be held in Johannesburg in August–September 2002.

One section illustrates employment and learning in a learning society. Education, when it occurs as a lifelong process of learning, is considered an important aid in attaining sustainable development and integrating aspects of maintainability in all sectors of society. Good knowledge is viewed as necessary if a person is to be able to utilise information and make choices as a consumer and member of society.

In one particular section, the responsibilities that higher education and research have for sustainable development is discussed. There, the implementation of environmental management systems as an important aid in effecting a change towards a sustainable development is described. Colleges and universities have a long-term environmental effect on the surrounding world through education and research and cooperation with local society. More than one seat of learning has established new environmental goals, expanding them to include the idea of sustainable development. One of the effects of the environmental efforts of universities and colleges has been a growth in the number of undergraduate programmes and courses that have integrated an environmental perspective or the idea of sustainable development in their syllabi.

This section also discusses the goals set for education and research that are connected to sustainable development under the terms of collaboration in Baltic 21 (Agenda 21 for the Baltic Sea Region), in Nordic collaboration, and in EU cooperation. Strategies for sustainable development in these regions have been drawn up.

The Copernicus document

Copernicus (Cooperation Programme in Europe for Research on Nature and Industry through Coordinated University Study) is an independent organisation closely connected with EUA (European University Association, formed in 1988). The organisation was created to work for a sustainable development within the bounds of higher education and research in agreement with the recommendations of the Bruntland report and the documents that were adopted at the Rio conference in 1992.

The aim of Copernicus is to involve European universities in a network for the sharing of knowledge and experience in the field of sustainable development. Another purpose is to foster collaboration between industries and other public actors. As a result of the Rio conference, the Copernicus document on sustainable development was set up in 1993 (Copernicus University Charter for Sustainable Development). Universities and colleges in Europe who sign the document pledge to comply with 10 principles, thereby creating an internal process in their organisation that promotes sustainable development. Today more than 290 universities and colleges have signed the document.

The Copernicus document emphasises that education is a prerequisite for creating new values and increasing the awareness of human beings of environmental and dev elopment issues. This education must take place at all levels of society, particularly at the university level where future decision-makers and teachers are educated. Universities and colleges have a special responsibility since they educate future generations and harbour knowledge in all fields of research.

The Copernicus document is a follow-up of previous initiatives from universities that have been concerned with responsibility for environmental issues such as the Magna Carta of European Universities, Bologna, Italy, September 1998; University Presidents for a Sustainable Future, the Talloires Declaration, October 1990; Urgent appeal from the CRE, the Association of European Universities, presented to the Preparatory Committee for the United Nations Conference on Environment and Development (UNCED), Geneva, Switzerland, August 1991; and Creating a Common Future: An Action Plan for Universities, Halifax, Canada, December 1991.

The Haga Declaration

In a meeting at Haga Slott [Haga Castle] in Stockholm, Sweden, 23–24 March 2000, the Ministers of Education from the Baltic Sea States adopted a declaration to implement Chapter 36 on educational issues in Agenda 21.

The document stresses the importance of including not only economic but also environmental and social issues in the concept *education for sustainable development* (ESD). It is emphasised that education for a sustainable development means a learning to improve the quality of life of present and future generations. Execution of Chapter 36 is a prerequisite for the successful implementation of the other chapters in Agenda 21; in other words, education and training and an increase in the general level of knowledge are necessary before measures can be taken in other areas of society.

The declaration contains a plan of action (Agenda 21) for education and training and sustainable development in the Baltic Sea Region. The document also states that learning about sustainable development is a lifelong process and should therefore be included in all levels of education in society. Teachers and other educators play a key role here, where personnel must be trained so that they can foster in students the skills to be able to critically analyse and prioritise measures founded on sustainable development. The document also stresses that social learning and learning about democratic processes are a prerequisite for a sustainable society.

All educational institutions play a significant role in implementing Agenda 21 and should consider both international and national strategies for sustainable development in their work. Efforts to foster education and training for a sustainable development should also be considered an important part of the work to change insupportable consumption and production patterns by providing insight for the view that today's lifestyle must change.

The Mandate of the Swedish Government

As part of the work for an ecologically sustainable development, the Swedish government decided on 19 December 1996 to initiate a pilot project to integrate environmental considerations into government operations. In the beginning, 25 authorities were appointed. The mandate comprised the following tasks:

- Conduct an environmental impact investigation.
- Write proposals for policy.
- Initiate and, as far as possible, prepare a plan of action for the continued integration of environmental considerations in the work of the authorities.

In the communication to the Swedish Riksdag on ecological sustainability (SOU 1997/98:13, p. 12), the government maintains, among other things, the following concerning work in the government:

> "To integrate the ambition to be leaders in the work for ecological sustainability into the decisions that concern different sectors of society is a heavy responsibility for the different departments and public authorities. The work that was begun in the implementation of environmental management systems in government activities should be developed further".

On 18 December 1997, the Swedish government decided to assign an additional 30–40 authorities the task of implementing environmental management systems. Mdh in Västerås was among these and volunteered in 1996 to participate as a pilot authority. By 1996 the University had begun work to become environmentally certified according to the international standard for environmental management ISO 14001.

Environmental Certification of Mälardalen University

The University's policy for a sustainable development

When Mdh became environmentally certified in April 1999 according to the international standard for environmental management, an environmental policy was adopted. As environmental work became more and more an integral and natural part of the University's activities, the environmental policy was replaced in December 2000 by a policy for sustainable development that encompassed not only the ecological dimension but also the social and economic dimensions of the concept sustainable development. The policy emphasises that the University's task is to promote the observance of all the dimensions in their operations.

For the University's part, this means working to increase the knowledge of employees, students, and other co-workers so that they have the ability to analyse critically and prioritise the measures that take into account more than one dimension of sustainable development. Mdh is able, through its activities, to directly or indirectly influence society in the direction of sustainable development. This happens through:

- Education and research.
- Daily operations.
- Contacts with local society and its leading representatives.

With education and research, the University will contribute greater knowledge on and insight into a sustainable development. To contribute to a sustainable development also demands that employees and students act in a sustainable manner in their daily activities so that economic, environmental, and social aspects are observed in the University's operations.

Implementation of the Environmental Management System

Mdh has two campuses, one in Västerås and one in Eskilstuna. The University employs approximately 800 people, of which approximately 600 are teachers. Approximately 13,000 students are enrolled in the University.

Working with environmental issues at Mdh is nothing new. In 1992 the University board adopted the goal to give students more knowledge on sustainable development. It was, however, unclear how that would happen in practice. The university president decided that, to further efforts and be a good role model, the University would introduce an environmental management system according to ISO 14001. The goal was to be the first government authority to go the whole way and environmentally certify operations by allowing external environmental auditors to carry out an audit. At the same time the government b egan a pilot project to implement environmental management systems in the framework of government activities. In 1997, Mdh declared its interest in participating in the project.

In December 1995 all employees received a letter that described the University's intention to start a project to attain environmental certification according to the international standard for environmental management ISO 14001. A project manager and an environmental co-ordinator were appointed at each institution and department.

A detailed project plan was set up where the project's execution was described step by step. The introduction of the environmental management system was calculated to take approximately two to three years.

The following activities were conducted between 1996 and the spring of 1999, when Mdh received its environmental certification:

- Drafting of a project plan and the project organisation.
- Education and training of all employees.
- Execution of an environmental impact investigation to identify and assess significant environmental aspects.
- Education and training of the university president, the directors, and the environmental co-ordinators.
- Drafting an environmental policy, environmental goals, and plans of action.
- Development of documentation that describes the routines in the environmental management system.
- Execution of internal environmental audits.
- Follow-up of the result from the internal audit at the management level.

Parallel with the above activities, a collaboration with a Swedish certification body was set up to inspect the University's environmental management system. The environmental auditors from the certification body inspected the environmental impact report and the model that was prepared to evaluate the environmental aspects of the University.

In the environmental impact report, Mdh emphasised that environmental efforts were primarily a matter of integrating environmental components in education and research to effect a positive influence on the environment. Responsibility remains, however, to minimise the negative effects on the environment that arise in the carrying out of activities such as business trips by car, waste disposal, paper consumption, use of chemicals, and so on.

Environmental auditors were also engaged to inspect the routines that were developed to fulfil the requirements for an environmental management system according to ISO 14001. In December 1997, a preliminary revision by two environmental auditors of different areas of the University's activities was conducted. The aim of the audit was to assess the progress that had been made in introducing the environmental management system. A number of discrepancies were found.

The University decided to continue its work. In 1998, the discrepancies were resolved and in December of the same year the certification audit was conducted. Three external auditors inspected the University's environmental management system for three days. A few minor discrepancies were noted. These were remedied in the spring of 1999. In April of the same year, the University received its environmental certification.

Driving Forces and Obstacles in Environmental Work

In brief, the following driving forces and obstacles in environmental work can be mentioned:

- To introduce and maintain an environmental management system in the long term requires management's support and will to further the process.
- It is important that the process is supported by the political administration and by other external mandators, for example by a requirement to report back to the Ministry of Education.
- To implement an environmental management system is a process of change where environmental efforts must be allowed to mature and develop. The work must be allowed to take time, but it is also important that the work does not loose momentum.
- The environmental management system makes environmental efforts legitimate, both internally and externally.
- A clear organisation and a timetable detailing the activities necessary for certification are imortant.
- The environmental management system is a good tool for the communication of environmental efforts, internally and externally.
- To a large degree, the work involves influencing people's attitudes towards environmental efforts.
- The environmental management system is an impoıtant component in the University's efforts to market itself.
- The environmental management system encompasses all areas of the University's organisation; this means that the institutions and the departments must collaborate.
- Environmental efforts lead to monetary savings in the long term. It is important to see environmental efforts as an investment—not only an expense.

Sustaining the Environmental Management System Formatted

When it became environmentally certified, the University demonstrated that there are routines suitable for a university environment according to the requirements of the international standard for environmental management ISO 14001. After environmental certification, work has consisted of continuing to develop these routines.

First now, in the spring of 2002 are these routines considered to be well established in the daily activities. Below is a description of the routines that the University follows and which the University is developing and furthering in environmental efforts in a continual process of improvement.

Environmental Management Routines

ISO 14001 describes in brief the routines that are required for an environmental management system to be considered to be implemented in an organisation. Since the standard was designed for all types of organisations, guidelines for how these routines should be formulated

for a university or college are lacking. An important task in the certification process was to interpret the standard so that it could adapted to the University's activities.

The standard requires that an organisation enact an environmental policy. For the meaning of the policy to be put into practice, there must be routines for planning, conducting, inspecting, and following up environmental work. The purpose is to carryout environmental work in a continual process of improvement. These routines are called environmental management routines.

Environmental Policy

In 1997, the University adopted an environmental policy. It was valid until 2000 when the policy was replaced by a policy for sustainable development in all dimensions of the concept. The policy is disseminated and grounded in the organisation by the university president, the directors, the environmental supervisor, and the environmental co-ordinators. This occurs internally during the regular, scheduled meetings. New employees are given a two-hour review of the policy during their introduction to the University's environmental management system.

Students and the general public also have access to the policy via the University's home page. When new students start university, they are informed about the University's environmental efforts. In their annual review of the environmental management system, management evaluates the relevance of the policy.

Environmental Organisation

The university president has the overall responsibility for seeing that the environmental management system is upheld and that environmental work progresses in a continual process of improvement. The environmental supervisor for the University is the president's contact person in environmental issues and ensures that the environmental management system is practically and administratively upheld. Department chairpersons are responsible for upholding the environmental management system within the bounds of the institution's activities. Each institution has an environmental co-ordinator who supports the department chairperson in environmental work.

In the university administration, the administrative director and the department heads are responsible for following current routines for environmental work. Each department has an environmental co-ordinator who is responsible for the environmental efforts in the department.

Environmental aspects, environmental influence, and environmental impacts

A review and assessment of the University's environmental aspects was made to determine the significant influences and impacts of the University on the environment. Environmental aspects and environmental impacts of the University were found in two areas:

- Education and research
- Daily activities

Positive environmental influence occurs within the bounds of education and research when students and other collaboration partners increase their knowledge of the environmental field.

A negative environmental influence arises in the daily activities when finite and infinite resources such as energy, water, expendable materials, and transportation are consumed. The environmental impact analysis resulted in a list of the University's significant environmental aspects. These are covered in the following:

- Environmental components in education and research
- Consumption of heat and electricity
- Business trips by car, plane, or bus
- Consumption of paper
- Use of hazardous chemicals
- Waste products and dangerous waste products
- Use of computers
- Use of office supplies and laboratory equipment

Comment: ? 'restavfall'

The most important area for the University to observe is environmental components within the bounds of education and research. Environmental work is largely about influencing the attitudes and behaviour of people. When the institutions are granted funds for education and research each year, they must commit themselves to work with the University's environmental goals.

The university administration requires that institution goals be presented in the institutions' plan of activities and in the annual report. The regulations for drawing up educational plans state that the purpose of education is to be coupled to a sustainable development and that it should be clear from the content of the educational plan that all students are to receive an introduction to the concept of sustainable development.

In the University's curriculum and syllabi is a compulsory heading "Environmental aspects" where the course instructor is to specify whether the course is wholly environmentally related, contains environmental components, or contains no environmental components. If the course does not contain any environmental components, the instructor must specify how to take into account other significant environmental aspects such as paper consumption. All course evaluations must include a question about whether environmental issues were taken into account sufficiently.

The research strategy underlying the research conducted at the University contains the concept of sustainable development. For individual research projects, the University requires that the environmental relevance of the research project be stated in the project specification.

The environmental co-ordinator at each institute compiles a list every year over how many of the courses sponsored by the institute contain environmental components. The same is done for research projects. This information is then compiled for the entire University by the environmental co-ordinator at the education and research department. The information is included in the University's annual report and is presented by the environmental supervisor for the senior administration.

To conserve electrical consumption, routines have been formulated that describe how lighting, computers, and other equipment are to be switched off, and so on. The University's heat consumption is managed by the property manager whose responsibility it is to see that the system is optimal from an environmental point of view. In new construction, environmental requirements for the systems that are to manage the University's energy consumption have been developed.

Routines have been set up to adapt the University's transportation to environmental requirements. Since the year 2000, the buses between university campuses have been replaced by trains for employees and students who ride free of charge. In general, employees are encouraged to travel in as environmentally adapted a manner as possible. Financial managers at each institution and department present information on the number of business trips taken by car to the environmental co-ordinator every three months. This information is presented at different internal meetings to other staff.

To conserve paper, routines have been set up to encourage employees to keep paper conservation in mind by refraining from printing out information unnecessarily, making too many copies, and so on. The Repro Department, which photocopies commissioned work, keeps statistics on how often institutions and departments use double-sided copying.

Previously, students at certain institutions could use as much paper as they wanted, which created enormous waste. The University has therefore developed a system where students are allocated a limited amount paper, about 200 sheets per year. Additional paper must be bought by the student. The University has reduced paper consumption by more than 10% in two years.

Chemicals are used in limited scope by the institutions that conduct laboratory activities. These institutions have their own routines for handling chemicals. The hazardous waste products produced in the laboratory activities are disposed of according to relevant laws and regulations. Other waste products include fluorescent lamps, low-energy bulbs, and batteries.

The University has developed a special system for recycling. Today, many different fractions are sorted according to relevant routines. For this to work, modules have been placed in public areas and in the lunchrooms and corridors of institutions and departments. Electrical and electronic products are to be given to the university janitor.

The University also has environmental requirements for the purchase of equipment. Computers are procured centrally via the Senior Buyer at the Department of Budget and Finance. Office supplies and laboratory equipment are purchased by the procurement officer at each institution and department. When equipment is in operation, it is to be maintained and when possible, reused.

There are today routines for determining the annual share of environmental components in education and research and for compiling the annual consumption of resources, for example the amount of electricity and heat, the number business trips taken by car, and so on. This takes place when information is to be put together for the annual report.

The Ministry of Education has special accounting requirements for the environmental work of universities and colleges. As new environmental aspects arise, for example in new projects, the environmental supervisor is informed. The officer evaluates the environmental aspects and supplements the list of the University's environmental aspects.

Statutes and other requirements

The University has compiled a list over current statutes and other requirements for the University's operations. The statutes comprise laws, ordinances, and regulations that are compulsory. Other requirements are, for example general advice and instruction, environmental requirements from collaboration partners, and so on. The list is updated continuously. New requirements are disseminated to the personnel concerned. Courses in the statutes and other requirements that apply to the University are arranged each year for new directors and environmental co-ordinators.

Environmental Goals

To pursue environmental work in a continual process of improvement, the university president, based on the University's significant environmental aspects, adopted new environmental goals for the years 2001–2003. These are the following:

- That the programmes, curriculum, syllabi and research projects of each institution—when possible—emphasise and deal with environmental aspects.
- That students and researchers are given a general introduction to the concept of sustainable development.
- That the curriculum contains optional courses in the environmental field for students and researchers.
- That interdisciplinary programmes, courses, and research projects that illustrate environmental issues based on the concept of sustainable development are offered.
- That employees and students are good role models by acting in an environmentally conscious manner.
- That there are local, regional, and global networks that promote education and research in the environmental field.
- That there are networks in the environmental field where collaboration takes place with industry and other independent sectors.
- That the University's internationalisation efforts are analyzed relative to effects on the environment.

During 2001–2003, the University will continue its efforts to minimise paper consumption and waste products. This means that:

- The use of paper will decrease by 8% per employee and student from the base year 2000.
- Waste products will decrease by 10% per employee and student from the base year 2000.

Plans of Action for Accomplishing Environmental Goals

To attain the above environmental goals of the University, institutions and departments develop their own plans of action. The plans of action describe measures, the person in charge, resources, and when the measures are to be executed and followed up. They are prepared by the environmental co-ordinator in collaboration with the department chairperson, personnel, and students. Decisions on plans of action are taken by institutions in their board meetings and by the departments in a corresponding forum.

Education and Training, Awareness, and Competence

The University has developed routines for continual education of the University's personnel in the environmental management system. Education and training are provided for all new emp loyees. Special education and training are given to directors and environmental co-ordinators, representatives of the student body, and certain occupational groups such as the University's suppliers and entrepreneurs. The University also assists in external conferences and contracted courses on environmental issues. In the fall of 2000, all teachers and researchers were given a course on sustainable development within the bounds of higher education and research.

Internal and External Communication

The internal communication of environmental work takes place within the framework of the regularly scheduled meetings on different levels in the organisation. Environment is a standing item on all agendas. The list of significant environmental aspects is attached to aid in efforts to clarify environmental issues during the meeting. Three times each term the environmental supervisor and all the environmental co-ordinators meet to discuss the University's environmental efforts.

The external communication consists of information to students and other collaboration partners. The Information Department is responsible for the presentation of environmental efforts in joint university documents such as the university catalogue, advertising campaigns, and so on. The Department of Budget and Finance is responsible for the University's procurements. Procurement policies include environmental requirements with which suppliers and entrepreneurs must comply.

Environmental Documentation

The University's environmental management system is documented electronically on the University's home page under *Environmental management*. All central documents are accessible there, such as the University's policy for sustainable development, environmental goals, the University's environmental handbook, environmental management routines, routines for managing environmental aspects in daily operations, contact persons in environmental work, environmental links, and so on. Each institution and department also has a home page where their own environmental efforts are described.

Routines have been set up for preparing and updating environmental documents. The main documents are updated by the environmental supervisor and are reviewed and approved by the university president or administrative director.

The documents that are associated with individual institutions and departments are created and updated by the environmental co-ordinator and are reviewed and approved by the department chairperson.

Assessment of Environmental Efforts

Routines have been set up to monitor environmental work in daily operations and during the annual internal environmental audits. The environmental co-ordinator presents a quarterly report on the progress of the work according to the plan of action. Deviations from documented routines are detected in a system for resolving instances of non-compliance. Depending on the nature of the deviation, it is reported either to the environmental supervisor or to the environmental co-ordinator, who decides what adjustments and what preventive measures are needed.

During the annual environmental audit, a review of the environmental management system at each institution and department is made. Any discrepancies are reported to the institution or department concerned. In the course of the audit, a risk analysis, a survey of educational needs, and a special documented review of compliance with relevant laws and regulations are made. The results of the internal environmental audit are compiled in a report that is presented to the entire University.

Follow-up of Environmental Efforts

The environmental supervisor reports on the progress of the environmental work to the senior administration. This happens once every three months and during the administration's annual review of the environmental management system. The review is based on the results of the environmental audit and comprises, among others

- Compliance with current statutes and other requirements.
- Needs for changes in environmental policy, environmental goals, and plans of action or other areas of the environmental management system.
- Follow-ups of target fulfillment and the adoption of new objectives.
- Requests by students and other interested parties for environmental measures.

5.2 Conclusions

The conclusions that can be drawn in light of sustaining an environmental management system are the following:

- The definition of sustainable development is still unclear and leaves room for individual interpretations; each organisation in society must therefore develop their own competence to be able to govern correctly and make well-thought-out decisions.

- Consideration must be taken to the complexity of the questions and how different economic, social, administrative, and cultural conditions affect the implementation of a task on different levels in society. It is therefore important to continue to discuss the concept to find a definition that makes it more practical to use on an organisational level.

- Sustainable development is not a static condition but a dynamic process where all participants in society must be involved. Since the surrounding world continually changes, goals and funding must also be developed continuously.

- The environmental management system's systematic and structured method of working can also be used to work with social and economic issues associated with the concept of sustainable development and in this way create a common management system for handling these issues. The purpose is to further the organisation's work toward continual improvements and thereby towards a sustainable development.

Kristina von Oelreich
Mälardalen University
Box 883
SE-721 23 Västerås
Sweden

Telephone: +46-21-101300
kristina.von.oelreich@mdh.se

6. Literature

1. Agenda 21.
2. SOU 1997:105 Fem år efter Rio - Resultat och framtid [Five years after Rio – Results and the future].
3. The Haga Declaration, 23–24 March 2000.
4. The University's environmental audit for 2000–2001.
5. EU sustainable development strategy (SDS): A test case for good governance – Position Paper of the European Consultative Forum on the Environment and Sustainable Development.
6. Swedish national strategy for sustainable development, written government communication 2001/02:172.
7. En hållbar utveckling - En ny kurs för Norden [Sustainable development – A new course for the Nordic countries].
8. An Agenda 21 for the Baltic Sea Region—Baltic 21—Baltic 21 Series No. 1/ 98.

Return to Contents

27. System performances and sustainability of Higher Education in Nigeria.

Tokunubi S. Osinubi & Lloyd A. Amaghionyeodiwe

University of Ibadan, Nigeria.

DEPARTMENT OF ECONOMICS
FACULTY OF THE SOCIAL SCIENCES
UNIVERSITY OF IBADAN, IBADAN, OYO STATE, NIGERIA
Tokunbosinubi@yahoo.co.uk / lloyd2001sincity@yahoo.com

1.0 Introduction

The general feeling about Nigeria's educational system in recent times is that it has not been performing up to the standard expected of it. In fact, the complaint is that the performance is on the decline. Ekaette (2001) commented on the issue of the state of our educational system when he pointed out in his address to the convocation of the University of Uyo, Nigeria that a major decline in the nation's educational system and failure to achieve (its) basic objectives will obviously impact adversely on all other indices and hinder our march towards prosperity, progress and stability.
There is no question about the importance of education to national development. At issue however are the policy thrusts of government, the management of resources within the educational sector, the attitude of the participants in the sector (administrators, staff and students). Particularly troubling is the fact that, in spite of the massive funds injected into the educational system (albeit inadequate), the system does not seem to have benefited much from such injection of funds or at least has not responded in a fashion that would indicate that is has received positive impetus from increased funding. The objective of this paper is therefore, to take a fresh look at the issues involved, attempt to identify and analyze the main factors militating against positive system performance and make suggestions on system adaptability with a view to ensuring sustainability and averting total collapse. The emphasis would be on higher educational system in Nigeria.

2.0 Growth of Higher Education in Nigeria

The educational system in Nigeria is essentially a three-tier system made up of the Primary (including pre-primary), Secondary (Senior and Junior) and Tertiary. Each system has component parts through which its goals are accomplished. No analyses of higher education in Nigeria could be undertaken without placing in perspective the past historical development. In doing so however, we should also be able to look ahead into the future.

According to a National Universities Commission Report (2000) on the Nigerian University system, after an initial start with the establishment of one University College in Ibadan in 1948, then followed fourteen years later by the establishment of four additional universities, the system experienced a rate of growth, which could only be described as unusual. Between the years 1962 and 1998, the number of Universities in Nigeria grew from five to thirty-seven and students' enrolment jumped from 3,545 students to approximately 350,000 in the same

period. Similar rates of growth were recorded in other components of the higher education sub-sector.

However, the Federal Government of Nigeria, in order to demonstrate the high value it placed on the development of education and particularly higher education, committed massive funds to the education sector. Unfortunately, the pattern of development chosen was very wasteful and has contributed partly to the decline experienced in recent times by the higher education system. A large proportion of the funds allocated were spent on the development of brand new campuses built from scratch. Apart from the cost opening up these isolated locations and the cost of building, large sums were spent on the provision of municipal facilities and services. This pattern of development amounted to the building of brand new towns with the larger proportion of funds committed to physical development and relatively smaller proportion devoted to academic expenses. What is even more problematic is the need for maintenance of these physical plants, which consumes large sums and continues to deny the academic programmes of much needed funds. The consequences of this has been the gradual decline of academic work and especially a decline in the quality of higher education given the neglect of the libraries, laboratories and teaching equipment and other facilities which at the beginning enabled the system maintain high academic standards.

The decline and putrefy of the higher education sub system cannot be blamed entirely on the inadequacy of funds available for academic work. Other factors, which have contributed to the decline, include the rather low quality of the products of the secondary education sub system from which the higher education sector draws it students. It is a question of garbage in garbage out. We cannot talk about quality of output without addressing the issue of the quality of input. Furthermore, important as a factor is the fact that rapid expansion of higher education paid more attention to quantity than quality. Many of the academic and senior administrative staff recruited to be in charge of the institutions are no longer as qualified or as devoted to duty as those of the first generation universities, polytechnics and colleges prior to the expansionist era. The expansion of higher education was based largely on political consideration than on real needs. What further compounded this situation is the practice of virtually raiding the institutions of higher education for persons to be appointed to political positions in government. This practice had the effect of depriving the institutions of much needed human resources -already in short supply and produced at great cost- with the consequence that those left behind are overburdened and unable to cope with the demands of a growing student population. What is more, is that the teachers at all levels were poorly paid and often were not paid their salaries for months; and they sought ways of garnering additional income to support their families. It is in fact this poor remuneration that made it possible for government to attract away some of the staff of these institutions who, in the process of lobbying for political positions belittle themselves and rob the entire higher education system the respect due to them.

The macroeconomic and poor social conditions of the higher education also had their negative effects on the state of higher education. Motivation on the part of the students is no longer what it used to be. Unlike in the days gone by, products of universities and polytechnics have little prospects securing suitable jobs at the end of their programmes of studies because of the poor state of the economy. There is therefore little incentive for the students to apply themselves seriously to their studies.

Moreover, the political instability in the country and the disruptive impact it has on the educational system is not conducive to the maintenance of high standards. Students and staff were often involved in social and political agitation to the detriment of academic work. Academic staff found it necessary to unionize in order to fight for a living wage and favourable working

environment. This meant of course that valuable time and energy are devoted to these agitations with the consequent neglect of academic activities. When strikes are over, students are rushed through their academic programmes so that they can graduate and receive their certificates and diplomas. Students on their part are no longer inclined to exert themselves to obtain high quality education with a view to attaining academic and professional excellence. The end result of all of these is the glaring evidence of decline in and putrefy of higher education - in fact, of education at all levels. The government on its part now sees the higher education system as nest of troubles not deserving of the high regard accorded it in the past. There is, therefore, no love lost between the system and government.

David-West (1998), in his lecture on the 50th Anniversary of the University of Ibadan, Nigeria pointed out that the higher education system (particularly the university) were not insulated from the political upheavals which convulsed the nation…that unfortunately our universities, instead of playing their proper role, have fallen victim of some of the evils which plague us in this country. He goes further to talk nostalgically of a period of bloom for the university system saying, "In the period of bloom, we had real academic excellence, real international respect. Academic standards were high and never compromised. The staff-student ratio was high. There was discipline. There was self-esteem. The social life was polished. Devotion and dedication to scholarship was high. There were no academic-contractors. No academic stragglers. No squatters (academic frauds). Promotions were on merit. Degrees or Diplomas were deserved". David-West (1998) called attention to the need to take full cognizance of the lurking demon of decadence, a prelude to collapse. It is important that we do not allow system collapse to occur.

Presently in Nigeria our higher education is on the edge of the wall sitting rather uncomfortably. Before it falls off the wall and breaks into pieces unable of being put together again, urgent attention must be paid to the needs of the education sector. The consequences will indeed be dire for the nation if we continue to ignore the warning. The problem of education is that the effects of neglect are not immediately felt or appreciated. By the time it becomes obvious, much damage would have been done. While there is no doubt that the nation appreciates the importance of education to national development, it is not clear that the level of commitment of resources and the nature of application of these resources quite match our desire for education. The issue also of the content as different from the appearance of education is very important in determining the direction and quality of development.

3.0 System Performance and Sustainability of Higher Education in Nigeria

It is evident from all that has been said above that the higher education system is not currently performing to the standard expected by society and is in danger of becoming obsolete and irrelevant. System collapse may be imminent. Our interest in this section is to examine the factors responsible for the sorry state of affairs and ascertain what has to be done to avoid system collapse.

3.1 Structural Inadequacies

The educational system is structured to facilitate transition from one level to the next higher level. This is all right as long as each level performs its role adequately. It is, therefore, essential that each subsystem perform to specification because any failure in this regard translates into undue pressure on the next higher level to which the products

of a particular level move. Carmen (1996) in his study likened the educational system to a train which travels along a single track bound for one destination, but which ejects some of its passengers, without stopping, at several points along the route. Evidence abounds to show that the system has performed rather poorly at virtually every level. For our purposes, we will focus our searchlight on the higher education, that is, secondary and tertiary levels.

According to the National Policy on Education in Nigeria (1998), the secondary level has failed to offer diversified curriculum to cater for the differences in talents, opportunities and future roles of our children; failed to provide trained manpower in the applied science, technology and commerce at sub-professional grades; and to failed provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development as stipulated in the National Policy Education. The secondary education sub-system is simply not well equipped to perform these functions adequately. Poor staffing and poor facilities constitute an impediment to system performance. The consequence is that students are prepared only for academic work, that is, book learning and this is also not well done, as their performances at West African Examination Council would indicate. The products of the senior secondary education sector are generally poorly prepared for the requirements of the tertiary sector. What is particularly troubling is that the products of the lower levels of the educational system are increasingly of lower quality (Adesola, 1998). The quality of output at the higher level can only improve if and only if the quality of incoming students improves. Efforts to hold the deteriorating performance of higher education must therefore include improvements to education at the lower levels.

Part of the problem with staffing arises form the current status of teachers. The poor remuneration and poor condition of services of teachers as well as the low esteem of the teaching profession especially at the primary and post-primary levels act as a disincentive. Unlike in the past when the best among the graduates were recruited to the teaching profession, now only those who could not secure other employment accept teaching jobs. Even these only stay in the teaching profession bidding their time until a better job offer comes their way. For such persons, the teaching profession is just stepping-stone - a temporary tent - to be abandoned at the slightest opportunity. There is, therefore, no commitment to job. In spite of the pronouncement in the National Policy on Education (1998) that education shall continue to be highly rated in the national development plans and that education is the important instrument of change, the real operators – teachers – are treated as foot mats to be trampled on. Such a treatment of teachers cannot but result in poor staffing of the educational institutions. This in turn reflects on the quality of the students.

Discordance between policy statement and practice is not limited to the treatment accorded teachers. Students are also on the receiving end of the inconsistencies in the educational system. According to the National Policy on Education (1998), the transition from junior secondary to senior secondary education is to be based on the differentials in academic ability, aptitude and vocational interest. In reality, the technical and vocational streams are perceived as dumping grounds for academic failures being referred to as dropouts. They are, therefore, not destinations of choice. The facilities for evaluating aptitude and vocational interest are generally non-existent. Very few students benefit from guidance and counseling facilities. All of these reflect negatively on the quality of intake into the polytechnics and colleges of education who are considered second rate to university intakes. This perception is reinforced by the lower rating of products of polytechnics and colleges of education. Even where starting salary is the same as for

university first-degree graduates, the limit placed on how far they can rise in the labour hierarchy acts as a disincentive and brings further pressure on the university system.

Abdullahi (1982) commented succinctly on the structural relationship between the universities system and other components of the higher education sector. He contends that because the acquisition of paper qualification referred to elsewhere as the Paper Qualification Syndrome or PQS as in Carmen, (1996) is apparently given undue recognition in Nigeria; the pressure on the university system is bound to continue to be severe unless some measures are taken to remove these pressures. In addition to this assertion, Comet Newspaper (2001) reported that a representative of teachers in one of the Nigerian's polytechnics was reported as decrying the situation where, after five years of study to obtain the Higher National Diploma (HND), such graduates are compelled to spend another three year to obtain a first degree in the University. The impression is being given that university education is needed the only way of getting ahead in society, an impression which further compounds the problems of the university system since it leads to overload and system malfunction.

3.2 Policy of Mass Education

The Constitution of the Federal Republic of Nigeria and the National Policy on Education emphasize the very important of ensuring equality of educational opportunities to all Nigerians at all levels. As much as this is a desirable objective, note should be taken of the condition that the free education aspect of this objective should be provided when practicable. The provision of free and compulsory education at the primary level and free education at the secondary level are incontestable minimum conditions. The provision of free education at the university level is however subject to debate in terms of its desirability of the sustainability of the system. Various approaches to the provision of mass education especially at the tertiary level will be considered under the section of this paper dealing with policy recommendations. Suffice it to say here that the restriction placed on publicly funded federal universities not to charge tuition fees is preventing these institution from realizing their potential and is at the root of some of the problems which confront the universities today.

3.3 General Malaise in the Society

The civil war, the era of military rule and the general feeling of inequity and insecurity have had negative impacts on society in general. The educational system is not insulated from these impacts. Moral decadence is the rule rather than the exemption. Adesola (1998) commented on the issue of formal decadence in Nigerian society. He referred to recent events in Nigeria which show that one of our former heads of State and his security operatives were engaged in physical stealing large sums of money belonging to the country while starving the essential services, including education of needed funds. Adesola (1998) stated further that armed robbers had hijacked government. Recent disclosures about the level of corruption in government and society are indeed astounding. Little wonder then that students and staff of our higher educational institutions are involved in examination malpractice and other acts of moral decadence.

Higher education, the apex of the entire education system, must however, accept some responsibility system since mostof the operators of the system are products of higher education.

4.0 Looking Ahead into the Future

4.1 Impact of Technological Development

The concretization of recent and on-going developments in communications and information technologies has made it v irtually possible to interact as effectively as through face-to-face communication. This has opened new vistas for the educational system and enterprise to exploit. It is no longer an absolute necessary to be physically present in a classroom in order to d isseminate knowledge. Satellite communication and Internet connectivity, which depends on it, have rendered the brick and mortar classroom virtually obsolete. As a consequence, the huge investments in the construction and development of higher education campuses, which were mentioned earlier in this paper, are no longer necessary or efficient. We are approaching the stage where we can talk of campuses without location. Unfortunately, the physical structures are already in place and need to be maintained. Funds therefore need to be provided for their maintenance and adaptation so that they can still serve as useful bases for knowledge acquisition and dissemination. New physical structures should be kept to the barest minimum. Available ones should be effectiv ely utilized. The funds that would have been used to build extensive campuses can now be reserved for the procurement of modern technologies. The National Universities Commission should therefore review its requirements for establishing a university so as to be in line with modern developments. Emphasis should be on the means of disseminating information rather than on physical structures. Other bodies charged with the responsibility for coordinating and monitoring the development of other higher education institutions should likewise modify their requirements.

4.2 Distance Education

Since the developments mentioned above have effectively freed us from the tyranny of time and space, other alternatives and options for organizing the education enterprise can be explored. Citing evidence from Dhanarajan (2000), Agunbiade (2000) asserted that only 5 or 6% of the post-secondary educational demands of citizens of the Commonwealth countries is currently met by conventional systems of higher education. The demand for education is so high and is ever increasing that conventional system of educational delivery cannot meet it at an acceptable level of cost or within the required time frame. The option available is Distance Education. This was the verdict of the stakeholders in education at a meeting in September 2000 in Abuja, Nigeria where they resolved as follows: "…in order to enhance education as a form of human resources development, and satisfy the exceptional population, we resolve to adopt Distance Education as a desirable and inevitable mode for providing access to all and achieving equitable representation by taking the distance out of education". The adoption of distance education as a complementary mode of imparting knowledge will, if properly planned and implemented, help achieve many of the objectives of the educational system. It certainly will help relieve the pressure on the conventional university system. Distance Education, however, has its challenge and requirements, which must be met.

Institutions of higher education must rethink their approach to the delivery of instrument. They need to adapt to a student-centered rather that a teacher-centered system. Quality of the instructional materials must also be guaranteed. Institutions must redirect investments from physical structures to technology driven system of education. There is also the need to put in place mechanisms for sharing resources so as to reduce the level of capital cost to be borne by individual units.

The steps taken to revitalize distance education are quite commendable. There are however, a few troubling questions that need to be answered with clarity. Mention is made of a single mode model of open and distance education without explaining what is implied by the single mode. One hopes that this is not another attempt to centralize and homogenize educational delivery in the country. There is a lot to say in support diversity. Consumers are presented with the opportunity to choose from array of offerings and the resulting competition ensures improvements in quality of products offered. One would appeal to the planners that while facilities can be pooled to reduce cost through sharing, each participating institution should be left with the freedom to develop its programmes based on the resources available to it and the philosophy underlying its owns programmes. Minimum standards should be established and their maintenance monitored but institutions should not otherwise be unnecessarily constrained. The inadequacies in infra-structural facilities in the country, especially the epileptic supply of electricity, are bound to impact adversely on the development of a distance education system, which thrives best where power supply is regular and stable. The need to ensure stable and regular supply is more urgent now that distance has been adopted as a means of ensuring education for all.

5.0 System Performance

The purpose of higher education clearly go beyond the trinity of teaching, research and service taken at their face value. They involve the education of the individual to the understand society, achieve academic and technical competence in selected fields and explore cultural interests and enhance cultural skills; advancing human capability in the society at large through developing and making available new ideas and new technology, training talent and enhancing the information, understanding and cultural appreciation of the public at large; supporting intellectual and artistic creativity and evaluating society critically for self-renewal through individual though and persuasion.

Adalemo (1997) argues that universities have to subject themselves to the scrutiny of society, which funds them especially with regard to the efficient performance of the higher education system. The higher education system must however be informed clearly of what society expects of it. It could be argued that society has made known, through the policy on education document, what is required of the institutions of higher education and indeed of all the institutions making up the education delivery system. Often, however, these stated requirements are made unclear and indistinct by subsequent statements and directives from government and its agents. On the issue of research for instance, it is not clear whether society is aware of the limitations and constraints which face the institutions of higher education in the nature of resources and facilities available to them. The universities, for instance, are best place to undertake basic research whereas the polytechnics could, with some effort, undertake applied research. Society however expects concrete results and often criticize the educational system for producing intangible results. This is a case of misplaced expectation, which

leads to evaluation of system performance from unrealistic premises. More realistically, the intangible results of the university efforts should be further processed by other research institute whose products also in turn need to be taken over and concretized by industrial and commercial establishments. The point being made is that society needs to establish a network or chain of institutions, which will utilize and process the result of basic research that it becomes available in a form utilizable by agriculture, industry and commerce in a tangible fashion. The current situation in Nigeria is one in which the chain or network is not available, incomplete or non-functional for a number of reasons. Many research results, therefore, lie on shelves gathering dust. It is not the duty of universities to transform these into saleable products.

Even in respect of the role of higher institutions as producers of high-level human resources, they are not entirely to blame for the quality of their products. We have argued earlier that the poor quality of intakes makes it difficult for the institutions to improve in any appreciable way on what they receive from the secondary level, given the inadequate resources at their disposal. Compounding this is the craze for certificates in the country. The emphasis on paper qualification has not helped the situation. If and when the incentive system in the economy emphasizes performance on job rather than the academic attainment of the worker, students will be alive to the need to acquire usable skills and higher education institutions will be properly evaluated on the basis of the quality of human resources they produce.

6.0 Sustainability of Higher Education

The issue of sustainability has been discussed over and over again. It has been stated quite clearly that government cannot provide all the resources needed by institution of higher education to perform their roles adequately. Universities particularly have been directed to find ways of raising funds to supplement what government is able to provide. Yet, government had refused to allow these institutions to charge tuition fees. It has also limited amount chargeable on university provided accommodation.

Government is trying its best in the face of competing demands from other sectors to provide funds for education. Because of its policy of equal access, it has adopted the mass approach to education. This puts great pressure on government resources. Every sub-sector of the educational system complains of inadequacies of available resources because all of them are almost totally dependent on government. While it is true that available resources could be better managed, the fact is that they are grossly inadequate. The need to maintain the physical facilities of universities alone requires enormous sums of money. In a situation in which resources are scare and inadequate, it is reasonable to avoid over-commitment. The current circumstances in which the Federal Government of Nigeria has assumed responsibility for practically all levels of education result in government being over-loaded and over-extended. One would wish to suggest a review of the situation. Primary education is too important to be left to the vagaries of local government administration especially now that it is characterized by incompetence and irresponsible performance of its duties. It is the foundation of the educational system and unless the foundation is well laid, the super-structure can be endangered. Secondary education is equally important. In contradistinction to the analogy of the train running on a single track and dropping off its passengers along the route without stopping, secondary education should equip its inmates with necessary skill to make a living and contribute meaningfully to society. Only few who would be trained for

leadership positions to move on to the tertiary level. It should not be absolutely necessary to go to the university just in order to make a living.
Given the scenario enunciated in the preceding paragraph, it would be reasonable to concentrate government resources on the needs of Primary and Secondary education subsystem and make them tuition free. Tertiary level education should not be tuition free as that consumes a considerable proportion of resources that could have been made available to the primary and secondary levels to prepare students adequately for life in the society as well as for further education where needed. This view is unpopular. People like having free things. In the long run, however, they will realize that nothing is really free. Our insistence on free education at all levels has had the effect of ensuring that what we have is poor quality education at all levels. If we cherish high quality education, we need to do a rethink on the issue of free tuition at the tertiary level. It is only by doing so that we can ensure the sustainability of higher education.

7.0 Summary and Conclusions

The review of the educational system from a development perspective lead us to the conclusion that system collapse is imminent in Nigeria and urgent action is required to avert disaster. Structural inadequacies threaten to erode the ability of the ability of the system to perform leading to decay. The neglect suffered by higher education is probably due to the fact that the effect of such neglect is not immediately observable or felt by society. Discordance between policy statement and practice also plays its part in lowering the quality of education. Emphasis on paper qualification and general malaise in society is also contributing factors to the lowering of standards. In trying to look beyond these problems and chart a path which will enable us step back from the brink, some suggestion were made. We need to take advantage of development in communications and information technology. Distance Education is recognized as a means of coping with the increasing demand for the products of higher education while maintaining good quality and improving on current standards. The possibility of operating in classrooms without walls and overcoming the constraints of distance are indeed very encouraging developments. Distance education is to be adopted as a complement to the conventional system which in itself should be adopted to the changing situations. Existing physical infrastructures, which still have to be maintained, should be utilized effectively to support the dual modes of conventional and distance education. Care should be taken not to prevent individual institutions from developing their separate programmes, while sharing of resources is to be encouraged.
On the issue of system performance and the basis for evaluating the relevance of higher education to societal needs, the role expected of these institutions should be clearly defined. The limitations of the sector need to be understood. The products of universities, for instance in terms of results of basic research, should be processed by other establishments such as research institutes to produce tentative products (prototypes) which can then be promoted into real tangible products by industry. We need to establish such linkages between higher educational and industry, commerce and agriculture in order to fully realize the potential of the system.
Finally, it is suggested that government should allow higher educational institutions to charge tuition fees and realistic accommodation fee in order to ensure sustainability. This will also make it possible to release valuable resources for the use of lower levels of the educational system. The quality of the products of the primary and secondary

levels, which feed into the tertiary level, will make improvement in quality through the entire system possible. If these suggestions are given serious consideration, constructive and sustainable response to the crisis in our higher educational system will be assured and the currently imminent collapse of the system will be averted.

References Formatted

Abdullahi, A. (1982), "Structural Relationship between University System and Other Forms of Higher Education," *Adamu Baiki (ed), Higher Education and Development*, Benin City.

Adalemo, I, A. (1987), "The University of Lagos: Prospects and Challenges for the Future", in Aderibigbe, A. B. and T. G. O. Gbadamosi (eds), *A History of the University of Lagos*, 1962 – 1987, University of Lagos press.

Adalemo, I. A. and Baba, J. M. (eds), (1993), *Nigeria, Giant in the Tropics: A Compendium*, Lagos, Gabunmo Press.

Adalemo, I. A. et al (1997), *Higher Education in Nigeria*, Report of the University of the Lagos Emergency Committee on Higher Education Submitted to the Vice-Chancellor, February Typescript.

Adeniyi, E. O. and Ritilola, S. O. (eds), (1985), *Leadership and national Development*, Ibadan, NISER.

Adesola, A. (1998), *"Nigeria Universities and a Nation in Crisis"*, Distinguished Alumni Lecture, Universities of Lagos.

Ajeyalemi, D. (ed), (1990), *Science Education and Technology Education in Africa,* University of Lagos Press, Yaba, Lagos.

Agunbiade, S. (2000), "Distance Education" (Editorial) in Education Today: *Quarterly Journal of the federal Ministry of Education*, Abuja.

Angrist, S. W. and Loren, G. H., (1967), *Order and Chaos Laws of Energy and Entropy Pelican Book*, Penguin Books Ltd. Harmondswoth, England.

Axelrod, J et. al (eds), (1968), *Search for Relevance,* The Campus in Crisis American Association for Higher Education. Jossey-Boss Inc. Publishers, San Francisco, California.

Axelrod, J. et al (eds), (1968), *Stress and Campus Response.* Current Issues in Higher Education. American Association for Higher Education. Jossey-Boss Inc. Publishers, San Francisco, 1968.

Baikie, A. (ed), (1982), *Higher Education and Development in the Context of the Nigerian Constitution.* The report of the Fifth Annual Seminar of the Committee of vice-chancellors of Nigerian Universities. University of Benin, Benin City.

Carnegie Corporation, (1994), *Carnegie Commission on Higher Education,* A Digest of Reports of the CCHE.

Carmen, R. (1996), *Autonomous Development, Zed Books, London.*

The Comet (2001), "Yaba College of technology Teachers Kick against 'Foreign' Rector," The Comet Newspapers, Sunday, 17th June, P.3

David-West, T., (1998), *The Nigerian Academia: The Bloom the Gloom, and the Doom"*, 50th Anniversary lecture, University of Ibadan Alumni Association, Lagos Branch, 26th October.

Dhanarajan, G, (2000), "Distance and Open Education: An Overview," *Education Today, Quarterly Journal of the Federal Ministry of Education, Vol. 3 December.*

Ekaete, U.J. (2001), "Policy Focus and Value System in Higher Education", The Guardian, Lagos, June 18, pp. 58-59.

Fatunde, T. (2000), *"UNESCO's Initiative on Distance Education",* The Guardian, Lagos, pp. 47

Federal Ministry of Education, (2000), "Distance Education", *Education Today, a Quarterly Journal of the Federal Ministry of Education,* Abuja. Vol. 8, No. 3, December Special Edition.

Federal Republic of Nigeria, (1998), *Annual Abstract of Statistics*, 3rd Edition, NERDS Press Lagos.

Ogunleye, A. O., (1998), Science *Education in Nigeria: Historical development, Curriculum Reforms and Research*, Sunshine international Publishers ltd., Lagos.

Toffler, A, (1999), *Future Shock, Bantam Book (Random House Inc.), New York.*

Return to Contents

28. Developing an Environmental Policy Towards Greening Kenyatta University

Dorcas Beryl Otieno (Ph.D)

Paper prepared for the International Conference: EMSU 2002 in Africa, Environmental Management for Sustainable Universities: *The Role of Higher Education in Sustainable Development.* 11-13 September 2002, Rhodes University, Grahams town, South Africa.

By

Chair-Person, Department of Environmental Socio-Cultural Studies

School of Pure and Applied Sciences
Kenyatta University

FOREWORD
BY
THE VICE CHANCELLOR, KENYATTA UNIVERSITY

As the World summit (2002) on Sustainable Development (WSSD) in Johannesburg reviews the implementation of Agenda 21 in order to determine development trends for another decade, higher institutions of learning should participate. This is within the understanding that these institutions have a role in localizing agenda 21 to enhance the achievement of an environmentally sustainable future. They are expected to provide the awareness, knowledge, skills and values that enable individuals to pursue life goals in a sustainable manner for present and future generations.

Therefore as Kenyatta University strives towards becoming a university of the future, the need for it to adopt an environmental ethic of conservation and sustainability cannot be overemphasized. It is my hope that the implementation of the Kenyatta University greening policy will create a fully sustainable campus through environmental protection, education, research and community outreach activities. The Virtual University's Open Learning programme is one such area through which education and information for sustainability can reach majority of Kenyans.

The university management is therefore in support of the implementation of the greening project on recognizing some of the anticipated opportunities and benefits. These include: significant potential financial savings, Community responsibility and commitment to environmental protection; sustainable consumption; enhancement of environmental awareness and positive attitudes and actions towards the environment.

PROF. G. S. ESHIWANI
VICE-CHANCELLOR
KENYATTA UNIVERSITY

Introduction

There is a growing consensus among a wide variety of individuals, the scientific community national and international organizations that current strategies to meet human needs are unsustainable. Therefore there is a need to create a society that allows all present and future generations to be healthy and have: their basic needs met, fair and equitable access to the earth's resources, a decent quality of life and preserve and conserve the biological diverse ecosystems on which we all depend. This requires a shift in thinking values and actions particularly in higher learning institutions (which are the think tanks of developing nations) towards making sustainability and environmental concerns a central theme in all education. Greening Kenyatta University is a response to this need.

KENYATTA UNIVERSITY

Background

Kenyatta University is situated about 16 km south of Nairobi city– on the Nairobi-Thika dual carriage way on 1,100 acres of land. The University population is estimated to be approximately 10,000 people. This include, residential and non-residential students, staff, part-time students, supportive staff and primary and secondary school within the campus.

An audit carried out at the university revealed the following environmental problems :

- **Solid waste**- the management is not efficient and effective in most residential areas. This is because of the high population density of students and staff that generate a lot of solid waste.
- **Water shortage**- there is frequent water shortages in Kenyatta University and even the little that is available is not efficiently used.
- **Energy** – there seems to be negligence in as far as energy conservation is concerned. Students don't switch off the lights even when they are not using them. The cooking methods employed by the students and even the resident staff also consume a lot of energy in terms of power consumption .
- **Drainage**- there is poor drainage in the university due to poor soil characteristics and poor infrastructure development. Although the university has made a lot of efforts to improve it, there is still more that needs to be done.
- **Vegetation**- there is some efforts that have been made to plant more trees and establish flowerbeds but still the management of these plants is not perfectly done, some of them have ended up dying. Other areas of the university grounds do not have enough trees e.g. behind a residential area called Nyayo.
- **Water pollution**- there is evidence of water pollution in the neighbouring community (Kiwanja) as there is a growing industry of illegal brewing and other development activities.
- **Noise pollution**- there is noise pollution in the residential areas where majority of students reside. The noise originates from electronic equipment they are using.

The Mission and Vision of the university

The mission of the university is to provide high quality education, promote intellectual leadership, develop human resource, advance knowledge through research and enhance technological, economic and social development in Kenya. The University's vision is to be a centre of excellence in knowledge creation and dissemination, capacity building, instill democratic principles and increase access to higher education through open and life-long

learning for sustainable development. As Kenyatta University strives towards becoming a university of the future, the need for it to adopt an environmental ethic of conservation and sustainability cannot be overemphasized. This was realized during a
Seminar on Environmental Citizenship for Colleges and Campuses, held on 2nd February 2002 at the University.

This paper is therefore a contribution towards the said venture. It proposes a sustainable development policy model for greening the campus based on the following themes:

- Kenyatta University Environmental Management Systems (KUEMS)
- Greening of curricula, programmes and educational process
- *Translating academics into practical sustainable development projects at community*
- Student/staff action for change.

Formatted

Rational for Greening Kenyatta University

Greening Kenyatta University is within the focus of the forthcoming Johannesburg World Summit for Sustainable Development. It is a response to the call by agenda 21, for education for sustainability to address and re-define the links between environment and development concerns.
Agenda 21 recommends that countries;

- Set up training programmes for schools and university graduates to help them achieve sustainable livelihoods.
- Encourage all sectors including industry, universities, governments, NGOs and community organizations to train people in environmental management
- Integrate environment and development concepts, including demography, in all educational programmes. Etc.

The venture is in line with the merger of the millennium partnership for the African recovery programme and Omega Plan (MAP) which recognizes that, a healthy and productive environment is a prerequisite for the African initiative.

It is in pursuit of Kenya's sustainable development initiatives whose main objective is to ameliorate the negative effects of poverty, provide basic needs and meet people's aspirations for a better life. The government has committed itself to proper environmental management and therefore depends on national universities to provide capacity requirements and play a leading role in developing a multidisciplinary and ethically oriented form of education for its citizenry.

The programme will reinforce Kenya's strategic policies for the 21st Century which stresses education as a fundamental strategy for human capital development and a crucial factor for enhancing the quality of life and sustainable development.
It is also in line with Kenya National Environment Action Plan (NEAP) and
the sessional papers no. 66 of 1999**.** in which the Kenya government endeavors to strengthen the capability of training institutions and universities to fulfill their mandate with regard to environmental concerns and sustainable development.

The programme will be implemented within the Environmental management and coordination Act policy framework which requires that the students are acquainted with key environmental

issues, develop positive attitudes and commitment to the environment actively participate in resolving environmental problems; locally, regionally and globally.

Key components of the Kenyatta University environmental policy

The implementation of the KU greening policy should aim at creating a fully sustainable campus through environmental protection, education and research as well as cooperating with the society to promote a better understanding of the interaction between man and the environment.

a). It should be within the university and community development plan and include:

- Development and protection management of natural resources within the university and its environs.
- Prevention and control of waste.

b). It should involve the whole campus fraternity to make them aware of:

- the importance of their conformance with the policy
- the potential consequences of departure from the policy requirements
- the significant environmental impacts of their activities and the environmental benefits of improved personal performance

c). The policy should develop the university and community's environmental values and ethos.

d). The policy should consider student moral, spiritual, social and cultural development by:

- focusing on current and potential environmental situations while taking into account the socio - cultural historical perspective.
- considering the environment in its totality, that is natural and built, cultural and social environment.

e). The university should publicize the policy to ensure that everyone in the university and community is well informed

Plan of action

Developing Kenyatta University Environmental Management System (KUEMS)

Although many EMS models exist, this paper suggests the adoption of the International Organization for Standardization (ISO) model 14001. This plan should link all learning programmes, designate responsibilities and determine the methods and schedule of achieving the aims and targets towards achieving university sustainability which are:

- Develop a Kenyatta University community that is equipped with skills for addressing environment development issues.
- Transform the campus and its environs into a healthy working educational environment.
- Become a model Green Campus.

Specific Objectives

- Conduct university activities in ways that do not cause unacceptable degradation of the environment.
- Offer academic choices that will ensure its students, employees and broader community have opportunities to become environmentally and economically sustainable.

- Play an exemplary role by ensuring that its corporate operations become as environmentally sound as allowed by technology, economics and common sense.
- Promote environmental awareness and community education.

Principles of KUEMS

To realize the objective of "greening campuses/ universities", (Van Der Hout, 2000) via KUEMS, Kenyatta University should adopt the following principles of action adopted from the Copernicus Charter:

Institutional commitment: The University shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development within the academic milieu.

Environmental Ethics: The University shall promote among teaching staff, students and the public at large, sustainable consumption patterns and an ecological lifestyle, while fostering programmes to develop the capacities of the academic staff to teach environmental literacy.

Education of University Employees: The University shall provide education, training and encouragement to their employees on environmental issues, so that they can pursue their work in an environmentally responsible manner.

Programmes in environmental education: The University shall incorporate an environmental perspective in its work and set up environmental education programmes involving both teachers and researchers as well as students - all of whom should be exposed to the global challenges of environment and development, irrespective of their field of study.

Interdisciplinarity: The University shall encourage interdisciplinarity and collaborative education and research programmes related to sustainable development as part of the university's central mission. KU shall seek to overcome competitive instincts between disciplines and departments.

Dissemination of knowledge: Universities shall support efforts to fill in the gaps in the present literature available for students, professionals, decision makers and the general public by carrying out environmental audits, preparing informative, didactic material, organizing public lectures and establish training programmes.

Networking: The University shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.

Partnerships: The University shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans as well as local projects.

Continuing education programmes: The University shall devise environmental education programmes on these issues for different target groups: e.g business, governmental agencies, non-governmental organizations, community groups and the media.

Technology transfer: The Universities shall contribute to programmes designed to transfer educationally sound and innovative technologies and advanced management methods.

Steps in Implementing KUEMS
The seven key elements of implementing an eco - school programme are recommended.
(Otieno.D. B, Kavagi. L and Okoko.D 2001).

- **Formation of an Eco-university Committee**

The university should establish an committee that will be charged with the coordination of the environmental policy, through planning, implementing and evaluating the university's environmental activities to ensure their continuity and sustainability. The committee should consist of representatives of students, staff, administration, non-teaching staff the immediate community, the Vice chancellor, the University Senate and Council and the University Chancellor.

- **Environmental audits**

This is a systematic assessment of institutional management systems, policies and practices as they affect the environment and resource use. The audit will show, where KU is now, its course of development and where there is need for improvement. The campus environmental audit will serve as a catalyst for the creation of an environmental committee to review and address environmental goals. The audit will help identify strategies to reduce costs, environmental impacts, resources and energy consumption, waste generation as well as improve the overall health and aesthetic quality of the campus.

- **Monitoring and Evaluation**

The results of the audit determine the starting point for monitoring and evaluating the greening programme. This will be followed by subsequent maintenance, record of the progress and changes within and outside the university such as changes in behaviour , university aesthetics , and participation of the university in environmental activities. After a defined period of time , these changes will be compared with the initial survey results. Such a comparison will enable the university to observe and estimate the success of its eco-university programme and make necessary adjustments .

- **Informing and Involving the University and the Wider Community**

The whole university needs to be constantly informed about the activities in the eco-university programme. A variety of methods can be used by the eco-university committee to pass information to the wider community including notice boards, newsletters, university seminars questionnaires, exhibitions, the media, community events, campaigns for the environment, professional talks ,community service and environmental clubs.

- **Eco-code**

The university should develop a statement of objectives demonstrating its commitment to environmentally friendly actions. An eco-code aims at enabling the students and staff to develop personal values and codes.

- **Greening of Curricula, Programmes and Educational Process**

The university should incorporate an environmental perspective in all its work and set up environmental education programme involving lecturers, researchers and students all of

whom should be exposed to the global challenges of the environment and development irrespective of their field of study. The incorporation of environmental education into the curriculum should however not be seen as an additional workload but should attempt to build on already existing programmes.

Kenyatta University offers about thirty undergraduate programmes under the three schools. The following few examples illustrate how the curricula can be greened.

School of Pure and Applied Sciences
The School of Pure and Applied Science is a recent (2002) merger of the Faculties of Science and Environmental Studies, School of Human Science and Technology and the Institute of Kinesiology, Leisure and Recreation Management. The school is comprised of the two institutes and twenty departments:

The school has an undergraduate and postgraduate student population of over 1100 and 400 respectively. It offers certificate , diploma, post diploma, undergraduate and post-graduate programmes with emphasis on interdisciplinary training. Undergraduate programmes are available for the degrees of Bachelor of Science (B.Sc.), B.Sc. in Computer Science, Sports Technology, Recreation and Leisure Management, Telecommunication and Information Technology, Appropriate Technology, Foods, Nutrition and Dietetics, Textile Clothing and Design or Family and Consumer Studies and Bachelor of Environmental Studies (B.Env.S.)

Kenyatta University has made an attempt in this through the departments of Environmental Studies namely**:** Environmental-Socio-cultural Studies, Science, Foundations and Planning and Management. In addition, all students who enroll at the university for an undergraduate programme in the two schools of Education and Human resources and Pure and applied sciences, are required to take the following common units respectively:

- EEN 100 Environmental education
- FEU 100 Principles of Environmental Education.

This measure is clearly not effective especially for the students in the School of Education and Human Resource Development who have a vital role to play in the dissemination of environmental education. Efforts should be made towards incorporating environmental education throughout all the university courses in all the three schools.

Plate I: A botany classroom exhibition portrays greening of curricula

School of Humanities and Social Sciences
The school of Humanities and Social Sciences is a recent merger of the Faculty of Arts, School of Music and the School of Business. The school has four institutes, three centres and fifteen departments.

The School of Humanities and Social Sciences does not have a common unit on environmental education so the first step would be to introduce one. In addition, environmental components should be integrated in the various degree programmes. Eg.
Economics may be used to address environmental issues and at the same time provide a framework for integration of development and conservation. Courses related to economic policies and incentives should promote conservation and sustainable use eg. Regulatory and

economic instruments such as taxes, charges and subsidies can help to correct biases caused by the under pricing of natural resources and ecosystems.

Students of literature can enhance their environmental education through its incorporation in courses like poetry and drama eg. Giving assignments with environmental themes. Theatre Arts may also be used to promote environmental awareness.

Students in the Accounting department should incorporate eco/ environmental auditing into their auditing courses. They can be involved in conducting eco-audits on various Kenyan companies to determine whether they conform with environmental standards.

The School of Education and Human Resource Development
The mission of the school is to undertake high quality teaching and research in preparing and training personnel for quality teaching, research service to community through professionally developed technical and problem solving skills. The school comprises one Institute and twelve departments.

The Institute for Continuing Education offers B.Ed. and M.Ed. degree programmes for non-graduate practicing teachers drawn from both primary and secondary schools in Kenya. This is a popular programme among Kenyan teachers who require additional training in the face of changing demands for their profession.

EE can be enhanced in educational psychology through a discipline like environmental psychology. Students will have a better understanding of how the environment influences man's behaviour, his attitude towards the environment and how he responds to environmental problems. Students in the Department of Early Childhood Education could use courses like the development of the pre-school curriculum, to incorporates EE.

Education of University Employees
Many university employees' work has a significant impact on the environment. It is therefore important that the university identifies training needs for all its personnel. Employees should be made aware of the importance of conformance with the university's environmental policy and procedures, the significant impacts of their activities and environmental benefits of improved personal performance.

Kenyatta Virtual University(KVU).
Success in advancing education for sustainability programmes nationally and globally will depend on the extent to which advanced communication systems such as the internet are used to make information available to lecturers/teachers, students and the public. Globally, the rate at which the internet is being accessed is advancing at a lightening speed. The internet and the associated world wide web are highly efficient and cost effective systems for linking educators, policy makers, students, and parents interested in advancing education for sustainability. The Open Learning programme that is being introduced at Kenyatta University is one such an area that shall make education for sustainability reach the majority of poor Kenyans.

Formatted

Plate II : Students attending an internet based lesson at the Kenyatta Virtual University centre

- Translating academics into practical sustainable development activities/projects.

Active Involvement in Policy Implementation

The students should play a pivotal role in the execution of the environmental policy while the staff and the neighboring community give the support in the form of administrative, financial and also being part and parcel of the project implementation sessions and giving encouraging advice including logistical support.

Plate III: The Chancellor of Kenyatta University, His excellency The President of Kenya Daniel Toroitich Arap Moi Plants a tree as members of the university Council and community look on.

Research /organize Environmental Audits to Address Various Concerns.

Consultancy services in environmental management for various clients including government, Non-Government Organization's, Central Business Organization's development agencies, private companies as well as international organizations such as UNEP etc. should be encouraged. The involvement of the departments of Environmental Studies in the year 2001 in carrying out an Environmental Impact Assessment (EIA) in the controversial Titanium mining in Kwale district of Coast Province, Kenya ' the Lake Victoria Water Hyacinth' the 'Forest of Rwanda' research and the ICRAF-ANAFE project is commendable and should be encouraged.

Kenyatta University Outreach Programme

Operational Kenyatta University Outreach programme OKUO was established in 1994 to facilitate creation of mutual understanding between the university community and the surrounding communities. This is achieved by addressing the physical, education, social and training needs of these communities through networking, and participatory approach. It is through OKUO that university students and staff have participated in environmental clean-ups in various estates, market and precincts of the city of Nairobi have been cleaned during the culture week period and celebrated the World Environmental Day.

This confirms the commitment, which the staff involved in this exercise and the university at large has for their neighbours and the society at large. However a lot more needs to be done in order to green Kenyatta campus and its environs through clean-up exercises.

Global Village Club Kenyatta University has launched a solid waste management initiative on campus. The solid waste recycling will make use of wastes around campus into useful market products. Some of the products envisaged include organic ad foliar fertilizers, briquettes (alternative source of charcoal) and mats, carpets and mattresses from polythene papers.

Plate IV: Students involved in garbage collection exercise.

The following additional activities need to be undertaken:

- The planting of more trees in the institution to provide more shade, aesthetic value, regulate the micro-climate.
- Promoting sustainable consumption by encouraging the use of goods and services which ensure the wellbeing of individuals but which have minimal harm on the environment.

Kenyatta University AIDS Control Unit

The mission and vision of the ACU is to ''promote activities that will lead to a relatively HIV/AIDS free environment and to develop healthy and productive human resource for the nation'' Kenyatta University, in an attempt to realize this vision has developed policy guidelines on HIV/AIDS to mitigate its impact on students, staff and their dependants. This needs to be implemented within the holistic frame work of environmental health.

Culture Village

The university has established a culture village that promotes African culture both locally and internationally. Indigenous knowledge, which is promoted during annual cultural festivals, should be integrated into the modern environmental management systems. The resulting environmental models will be effective in promoting environmental sustainability.

Networking and Coordination of University Clubs and Activities

The roles played by clubs and societies KUNEC, NEP Global Village etc, cannot be underestimated if any meaningful achievement is to be made in greening the campus. These need to be well networked, co-ordinated and given administrative and financial support. While students should claim full ownership and responsibility, it should be mandatory to all new clubs/ societies to include the environmental components in their objectives.

Environmental Weeks and Days

There are several special occasions that are commemorated yearly at Kenyatta University. The events include *inter alia* the famous culture week, the interdenominational mass, thanksgiving ceremony, the first years inception ceremony and many more. Incorporation of environmental activities can greatly contribute to the greening campus campaign.

Fundraising Events

Students and the administration should be actively involved in fundraising events that can contribute to the greening of the campus concept through various micro-projects in the campus. The funds can also be used in organizing environmental days and awareness creation activities.

Environmental Awards

Awarding those who have shown exemplary efforts in creating environmental awareness and sustenance should be done frequently and best practices done through training and practicum programmes.

Benefits and Impacts of KUEMS

The paper concludes by identifying some of the opportunities and benefits KUEMS will provide to the University fraternity. These include :

- Significant potential financial savings through reduced costs on energy , purchases, waste management, etc;
- Better/healthy working/educational environment. reduced health risks and good image,
- Community image which further encourages the community to get involved in environmental protection .
- Waste reduction e.g through composting organic waste, recycling paper and waste water.
- Through promoting sustainable consumption , the use and sale of Eco-products at the university will be encouraged.
- Integration of sustainable development in the curricular will enhance its dissemination as university students carry it on to their future working places and the community in general.
- The environmental policy will provide a framework for :
- learning about the key issues of the environment.
- -develop positive attitudes &commitment towards the environment through promotion of the will ensure that its corporate operations become as environmentally sound as allowed by technology, economics and common sense.

As Kenyatta University strives towards becoming a university of the future , the need to adopt an environmental policy is apparent. This strategy is founded on the conviction that people can alter their behaviour when they see that things are better and can work together when they need to.

REFERENCES:

Keating M. (1993). Agenda for change; A plain language version of Agenda 21 and the other Rio agreements, Center for our Common future, Geneva.

Kenyatta University (2001). Kenyatta University 20001-2003 Calendar, Frejos Design Graphics, Nairobi.

Kenyatta University (2002). AIDS Control Unit Bulletin 2002, Kenyatta University, Nairobi.

Malcolm, P. (1999). Education for sustainable development: A unified approach to Environmental Education. Workshop paper, Bielefield ,Germany pp. 8-20.

Otieno, D.B. (2000). Need assessment for Environmental Action and Action Learning Programmes for rehabilitating Nairobi Rivers. Research Paper, KOEE, Nairobi.

Otieno D.B. , Kavagi, L; Okoko, D (ed) (2001). Eco-Schools/ environmental action learning capacity development and coordination seminar for the Eastern African Sub-region, 23-27 April 2001, Mombasa, Kenya.

Republic of Kenya, (1994). National Environment Acton Plan Report, Government Printer, Nairobi.

Republic of Kenya, (1999). Sessional Paper No. 6 on Environment and Development, Government Printer, Nairobi.

Serena V. B. (1995). A Practical Introduction to Environmental Management on Canadian Campuses, National Round table on the environment and the economy, Ottawa.

Van Der Hout, C. (2000),. Save Our Green Planet; Research into Students Activities with the Environment in South East Asia, University of Amsterdam, Amsterdam.

Return to Contents

29. Environmental Responsibility of Universities. The Environmental Management Systems

Prf. Dr. Eduardo Peris-Mora

Valencia Polytechnic University, Spain

1.- BACKGROUND.-

Three decades ago, in Stockholm, the First Conference of UUNN about Environment and Development took place and ten years ago a new conference took place in Rio de Janeiro. The first Conference was performed shortly after the publication of the report made by the Massachuchets Institute of Technology for the Club of Rome, just after a decade that started with the first steps of the space conquest, that contributed Gagarin's new perspective ("...that small spacecraft down there"...). Criticism towards the system began in same American Universities and all these feelings culminated in the 68's may in France, and in the Club of Roma summit.

The 1992 Summit took place just after USSR's collapse. The implantation of the so-called "world Market" consolidated the materialistic ethics and weakened by great means the social models of a state that protects and provides in social advantages. After the events of the 11th of September 2001, politics undertaken by the U.S. government, made us fear that the possibility to stop economic liberalism will weaken even more. The Americans renounce to all environmental protective regulations, this making us foresee difficult times ahead.

From that tense situation, in the spring of 2002, all we observed during the last three decades can be contemplated from a new perspective, which makes us point out three questions of relevant interest.

a) The last third of the XXth century is a historic period of a maximum level of economic growth in human history. The period culminates with the world market in which "everything can be bought from any point in the world" (At least those who have economic means to purchase goods).

b) The scientific and technologic productions have increased too-it is said that at present, more than 90% of scientist who lived through whole History are alive nowadays, and it does not take as long as it used to, to incorporate knowledge to technology accessible to population.

c) The Media has made possible a change in the perspective of the human condition. The events are transmitted when it pleases the person who has control of the Media –almost instantly and the same that happens with the market, the ideas or feelings extend without limit to frontiers beyond the States.

Starting from these three circumstances and during the same period, a series of transformations have taken place in the physical and biological side of Planet Earth. Far from

being the ideas of a few alarmist, these transformations constitute real threats that risk Human life in many regions of the earth:

1) The application of the big powers to human industrial works (Power plants, engines, big powered machines) provokes an indefinite threat regarding its magnitude, but certainly regarding its nature. Global warming is not only a threat since great weather transformation has already taken place. Greater catastrophes occur more frequently, and some great projects have turned out to be great failures, since regional transformations have taken place (Baikal lLake; Assuan; Iguauzu, etc.)

2) Massive consumption of Primary materials and the production of residues that characterizes the way of life of commu nities that ideologically lead the world, cannot be extended to all humanity. Some of the residues cause dangerous transformations in the atmosphere; others, being synthetic materials, are difficult to eliminate; new sickness and toxicologies appear.

3) Countries with advanced democratic systems see that the population is not satisfied nor adequately represented with regard to environmental politics. The alternative antiglobalization movement increases and represents an inorganic criticism to the system.

After world war II small or larger wars have taken place through the earth, constituting a "background noise" for the more accommodated part of the world. This situation and conflicts serve as a pretext to maintain very expensive armies as well as to justify the market of International Armament. In first world countries more or less organized critical groups arise, frequently unifying peace and environmental protection in their claims. Nature Conservative organizations that already existed at the beginning of the XXth century transformed, becoming more tolerant towards belligerent politics.
The ecological culture has transcended parliamentary institutions and their politics in general. The 60's decade was decisive for providing new points of view for the plant's richest society. One important point of historic reference is the social movements which started in some universities in the U.S.A. with the Hippy movement, and culminated with the events of may 1968 in Europe, with protagonist participation of students and trade unions.

2. THE ECOMANAGEMENT AND ECOAUDITING ESTRATEGIES IN THE BUSSINES

Recently, in in Europe and in the U.S.A., a series of instruments have extended constituting a means of differentiating and evaluating economic activities against the commercial competence. The "Quality Systems", the best known of which is regulated by the International Standard ISO 9000 (serial), establish uniform criteria of acknowledgement that enterprises apply the best technology available with the objective of "… providing the maximum satisfaction to clients". The industrial companies were the first to adapt themselves to prestigious quality control systems, and meanwhile, to secure for transactions between suppliers. Yet soon the services had incorporated themselves to that kind of management, so as to offer a more attractive image in nearly all the economic sectors. The Quality

Management Systems have extended from the industrial sector to services, hotel businesses, tourism, etc.

The standard ISO 9000 has environmental specifications when developed up to its last consequences; yet the standard ISO 14001 and derivations thereof established new critics of quality –in this case environmental quality- by establishing which actions are required for a correct Environmental Management in enterprises. The more recent European Regulation 761/01 is a more strict version than ISO 14000; Standard and Regulation establish the requirements for an Environmental Management System, so that this can be officially verified and certified by the accredited institutions.

The V Environmental Action Program of the European Union establishes general objectives to orientate its politics towards upholding. The evolution of the "environmental paradigms" (firstly, "he who contaminates mu st pay", then "prevention is better than cure") arrives in the last decade to establish the upholding as an objective the establishment of the "market corrections mechanism" as are the ecolabels –applied to products- and ecomanagement based on ecoauditing –applied to processes
The Standards ISO 14000, UNE 77.801/77.802 and the Regulations of the European Union 1836/93 and its new version 761/01, establish voluntary procedures by which industrial activities can be incorporated to a "Standardized Ecomanagemen t System" (Or Environmental Management System EMS).

3. UNIVERSITY AND ENVOIRONMENTAL MANAGEMEN

In the management world the Quality Management Systems (QMS) have been imposed as a consequence of the pressure an the necessity to improve the efficiency that impulses the competitive market and globalization. Everything can be bought in from any place, and only those "more apt" that offer the best products and services to universal clients will survive.

It is against the desirable that universities not alway s are the ideological locomotive for the best innovations –they should have good innovations- because sometimes its structure reacts too slowly to innovative winds. Universities are as service enterprises and it seems logical that they are submitted to some obligations of "good management" just like the rest of the organizations that society creates to solve its necessities. The institutions for higher studies try to cover the necessity for the formation of professionals and artists, at the highest level, they also develop research programs and they should propitiate the development of technology, theoretic thinking and artistic creation. These responsibilities have been assumed by the university centuries ago, sometimes they were successful, and others not, they are the cause that the university has possessed always a relatively high social prestige. This prestige is at a higher level than the salary that the professionals receive for their activity or with the priority what public Administration consider in its budgets for these professionals and these institutions.

It is accepted that universities are socially important. May be because of the "training factor" the consequences are reflected on society; both higher education –careers- and pre and post professional training (masters, permanent professional training of enterprises) have their implications on basic and applied research. With or without the unemployment crisis after ten

years the Companies, the private and public administration and the Services will have received the professionals who are today in the universities' lectures, shortly afterwards these professionals will occupy executive positions.

There is no doubt that the Environmental Management is one of the fields that most of the future professionals will compromise themselves. Just a few years ago some universities started to study the activities giving place to potential environmental impact. We started off by paying attention to pedagogical and research activities of laboratories and workshops in the campus that were producing dangerous residues, which until that time did not receive any more attention than that of careful pouring on the sink or spreading with urban solids residues in the campus.

Spanish Residues Law (10/1998, 21 April) forces enterprises to treat residues in an adequate way, in order to minimise pollution. The producers of dangerous residues are included in a list of either "small producer" or "big producer", and are obliged to contract any "accredited manager" disposing of resources for their management, transport and treatment or permanent definitive confinement.

In the 90's, most of the Spanish and European universities assumed the responsibility of good management their residues, most of them becoming "small producers" (less than 10 tons of toxic wastes par year) and initiating internal campaigns of conscientiousness all along the real producers. The students, or researchers, took over the responsibility of controlling, storing, identifying and adequately labeling the residual materials, which until that moment were simply thrown away by more irresponsible but easier and more comfortable means (Chik, 97) (HE21 98)

As far as I know, in the universities where they recur to an "accredited residues manager" for the treatment of dangerous residues, the expenses of this management is usually assumed by general budgets of each Institution. The acceptation of assuming the by-annual removals has been, in general, well accepted by the academic institutions. However, there are still some doubts about whether each "producer" of residues (professors or laboratory responsibles) should pay for the management of residues produced, and whether the participation in the programmes versus contamination had been successful.

In good logic, and in accordance whit the text and spirit of the Residues Law, it is the producer himself who should assume the responsibility of assuming the costs to "not contaminate" in the budgets for teaching or researching. The measure can be effective both in the sense of assuming the paradigm of "he who contaminates pays" and because having to pay would finally constitute an element of persuasion to the who teaches or investigates. In the search for savings, this will stimulate the election of techniques that will minimize or eliminate the pollution in origin, decreasing the necessity not to contaminate in the future. The fact that nowadays is the university (as an institution) and not the professor or researcher (or his Department) the one that assumes the costs of not contamination is a certain form of "socialization" or "externalization" the cost of not contaminating. This does not encourage the use of "good environmental practices" by those who recently edit programmes or design environmental projects.

Contamination is inadmissible, but not contaminating is expensive. Let's say for example that while one Kilogram of chloroform of analytic quality costs about 7 euros in the chemist-shop; when it has been used and converted in residue such as an impure blended liquid (may be diluted five times) it can be then 6 Kg of waste material, including the container. To be well managed it is necessary to pay a manager-bill of 9 euros par Kilogram. Frequently products are made more expensive as residues than as prime materials kept in storage, and accepting this reality represents an important change in focusing to plan the tasks and adapting budgets.

The European Union Standards is, with some exceptions, more advanced than each of the State members in the adoption of environmental protective means. The 761/01 Regulation of Ecomanagement and Ecoauditing is a good instrument for which enterprises certify the implantation of good environmental practices, incorporating them in a "list of enterprise Excellency". This is a refined version of the standards ISO 14001 which shortly appeared after the first version of the 1993 European Regulation. Actually, some European universities are certified under this Regulation and still no one reached the certification, despite some Spanish universities were the first to initiate the implantation process. The adoption of an Environmental Management System (normalized) would be a way of rationalizing the environmental management in general (this would include the solution of the problems of the management of dangerous residues) and, at the same time, it would constitute a proof of Institutional Quality.

More recently (May 30th 2001), the European Commission published a Recommendation relative to that acknowledgement: the publishing of the environmental questions in the annual accounts and the annual report of the companies. The contents of this recommendation results especially interesting in relation with the theme concerning to Spanish Universities and especially -or with greater reasons- in the context of a new Law of universities (LOU).

The Laws that regulate the management of public universities should include in their articles, at least, paragraphs regulating the form of edition budgets and the responsibilities about environment and quality management. It must also include references about environmental responsibility in which the university is concerned, and the so called 'Formation Effect', that represents the most transcendental environmental effect. It is inevitable to refer once again to the models of Quality system which are not university-like. In the enterprise competitive world the priority object of any Quality System (QS) is the one that gives a higher satisfaction to the clients. QS applied to the Spanish universities began considering that students are "clients" who pay for a service that the university offers. It cannot be forgotten that in public universities (autonomic and democratic), the students are an important part of the government as they have a large representation in the electoral bodies. In this sense, we can foresee that students may pay an important role in the development of this new Law. From the environmental point of view, and using a systemic analysis (materials, energy end information fluxes) we consider a more important effect called the "Professional Effect". We can consider that the student, just about entering in the university, is a prime material, and he will become (as a product?) a professional that will or won't develop the good environmental practices in his professional job. He will give work to the enterprises (other clients that contract him once he leaves university?) into whose personnel roster they will be incorporated (Smith, 1997)

But what can the Administration do, now, to assume its responsibilities in this process?. Good teaching is economically expensive (bad teaching is disastrous) as it is a bad research. The

program of subjects with their practice left to the criticism of the Schools or Faculties who must carefully administrate their resources. The university administrations in the different levels of each Regional Spanish Community criticises the "environmental accountancy" that makes a segregation in the annual accounts of the quantities paid for responsibilities met in the environment residues and specific investments. In the last extreme the ISO 14001 certification or European Regulation Audit in universities, could be an alternative to the best method of global evaluation in good environmental use.

On the other hand, research is financed in several different ways. It would be difficult to generalize the demands of environmental accounting for each of the demands of small projects of technological or applied research (or technical assistance) taking place in the universities. Spain and the rest of Europe has two sources of financial support, being the most important one a consequence of the European and Spanish politics. The Ministries responsible for Science and Technology should demand environmental accountancy in all the projects they finance, in their financial supporting programmes. Along with the complex documentation about fortressed costs that accompany the application, it is necessary to justify the part corresponding environmental management costs. The European Commission is actually financing many of the European research universities programmes lacking of a logic environmental Recommendation accountancy (Peris Mora & col. 1998) (Toyne, 1996) .

The European Union and the States should be the first standards acting in favour of general interest, sometimes demanding some effort to people and Institutions, and to improve justice or to protect the common environment, at present or in the future. Acting in the university may yield significant results and, for the moment, the governments have a great power of regulation on these institutions. Until now the initiatives of good environmental management in universities have been the result of volunteers within the institution, professors, staff or students. However, if Parliaments do nothing about this problem, it is still possible that Departments, workshops and laboratories maintain –with impunity- the traditional habit of dropping the toxic wastes trough the atmosphere, the sink or along urban residues. It is comfortable and cheap not to accomplish the Law.

4. THE IMPLANTATION OF AN ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14000 IN THE POLYTECHNIC UNIVERSITI OF VALENCIA

The organisation of the DGXI (calling to proposals 96/C75;DOCE C75/27) and trying to enlarge the possible application of the Regulation 1836/93, other spheres different to that of the industrial sector were tried in a experimental way. Among those activities, we included the education and Administration activities. The Politechnic University of Valencia presented a project which consists of the "Implementation and development in pilot-scale of a methodology to implant an Environmental Management System applicable to European Universities". These proposal was approved by the European Commission, and now the Politechnic University of Valencia is culminating the last details to become the first Spanish university, and one of the first in Europe, to be certified in part of its installations. This progress is following the recommendation of our study conclusions: the implantation step by step until covering the total organization. (Peris-Mora & Martin, 1998).

During 1997 and 98 a viability study of the implantation of EMS was carried out in the campus. Various representative units of the campus were considered as standard-university: schools and laboratories, cafeteria, experimental farms, library, etc. The results were submitted to diagnosis. Then, a methodology was developed adapted to the circumstances of a university with approximately 32,000 students.

5. CONCLUSIONS

University is a peculiar enterprise. When one compares it to other organizations in the industrial sector, the environmental management presents important differences which we now summarise:

The university can generate contamination residues generally in small quantities, but with great variety and, in the case of research activity, unpredictable.

The most important environmental effect is the one which refers to the principal "product" of the university: "training" and "I+D". Industry, Public Administration and Services will soon take professionals from the universities, as well as technology produced from university research. The capacity of the university activities to yield changes in environmental management is very important.

The institution of "Freedom of Professorship" which is traditionally maintained in the majority of European Public universities and the rest of the world, presents special circumstances with regard to environmental compromises to teachers and researchers through the environmental accountancy demand in the research projects and teaching.

6. REFERENCES

Chick, A. (1997) The "Greening" of Higher Education in the United Kingdom. The TEXT Consortium 1997 Annual Conference. Universidad Politécnica de Valencia. Spain.

Council Regulation (EEC) Nº 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community Eco-Management and Audit Scheme. Official Journal Nº L168, 10/07/1993 P. 0001-0018.

European Commission (1996) Proposal of Recommendation related to the European Cooperation dealing with Quality assessment in Higher Education. COM (97) 159 final.

Diario Oficial de las Comunidades Europeas. Procedimiento abierto 96/C 75/19). Actividades piloto destinadas a la identificación y explotación de áreas de actividad económica a los que el Sistema Comunitario de Gestión y Auditoría Medioambientales (Reglamento del Consejo 1836/93) se puede ampliar. DOCE, 15 de Marzo de 1996.

HE21 (April 1998), Higuer Education for the 21st Century. Environmental Management Systems: A guide for the HE sector.

ISO 14001 (1995) Environmental Management System Conformance Standard. The International Organization for Standardization. Geneva, Switzerland.

ISO 9000 (1993) International Standards for Quality Management. The International Organization for Standardization. Geneva, Switzerland.

Peris Mora, E., and Martin, J.E. (1998). Environmental Management Systems within the University. In: *Eco-Management and Auditing* , **5**, 136-145.

Peris Mora, E., Montañana, A., Amo rós, L. and Martin, J.E (1998). Environmental education: considerations about the Council regulation (CEE) No.1836/93. In: *Eco-Management and Auditig Conference; University of Sheffield.*

Smith, A. A. (1997) Greening of the Ivory Tower: Campus Environmental Management Initiatives in the United States. In: *Schools, Universities and the Environment. International Seminar on Environmental Care and Environmental Management Systems in Schools and Universities*, (28-38). Brussels.

Toyne, P. (1996) Environmental Responsibility: an Agenda for Further and Higher Education. Department for Education. HMSO. London.

UNESCO (1983) Trends in Environmental Education since the Tbilisi Conference. Programa Internacional de Educación Ambiental UNESCO-PNUMA.

BIOGRAPHY

Prf. Dr. Eduardo Peris Mora, School of Civil Engineering, Director of the European Project *Development of a methodology for the desing and implementation of an Environmental Management System based on EMAS to be applied in European Universities*, financed by the EC DG XI. Director of the Oficina Verde, Polytechnic University of Valencia, Camino de Vera, s/n. 46071 Valencia, Spain. Tel.: 00 34 6 3879564. Fax: 00 34 6 3877569. E-mail: eperis @ cst..upv.es.

Return to Contents

30. An environmental management qualification through distance education: potential and practicalities

Rudi W. Pretorius

University of South Africa, Pretoria

Keywords Environmental management, Sustainability, Higher education, Distance education, University of South Africa

Abstract Being aware of the environmental dilemma facing humankind, and specifically the developing world, the former Department of Geography and Environmental Studies at the University of South Africa recently played a pivotal role in the design and implementation of an inter- and multidisciplinary, undergraduate programme in environmental management. This programme prepares students for entry level occupations, and equips them with the knowledge, skills and values to be able to meaningfully contribute to sustainable development. Both BA and BSc students are provided for, which creates space for value-added education and the broadening of undergraduate education.

This programme has unique characteristics such as its inclusion at undergraduate level and that it is offered by means of distance education, which poses limitations but also have advantages. The teaching approach acknowledges that the causes of environmental problems are not simplistic, but rooted in the nature of political, social and economic systems. The solutions to environmental problems are regarded equally complex, requiring not only specialist attributes, but also value and structural shifts. To meet these demands, students are exposed to active resolution of environmental issues. In line with the latest trends in education, a student-activating approach is followed, with emphasis on real case studies, flexible application of knowledge, and opportunities for formative and integrated assessment.

This paper provides an overview of the experience thus far gained in the design and implementation of the referred to programme in environmental management. This experience can be of value to others, and also serve to stimulate discussion on how to improve education and training in this field. The results of a survey which was conducted among the students enrolled for this programme are presented. The responses of students generally reflect a positive attitude about the programme, especially concerning the interconnectedness of modules, the fostering of environmental awareness and usefulness concerning career objectives.

Introduction

World-wide institutions of higher education are involved in the integration of environmental concerns and issues in education and research, community projects and management of campuses (Van Weenen, 2000). This greening of institutions is associated with a growing concern about issues such as population increase, pollution, urbanisation and rising consumption, and what to do about it. In Agenda 21, the global plan for delivering sustainable development which was accepted at the Earth Summit in 1992, the role of higher education institutions is recognised as critical to promote sustainable development (UNCED, 1992).

Environmental management is one of the approaches available to achieve and maintain sustainable development (Barrow, 1999: 263). In environmental management the focus is on implementation, monitoring and auditing, on practice and on coping with real problems, and not so much on theorising (Hillary, 1995). Environmental management is also about human-environment interactions and the application of science to solve related problems. To this end an inter- and multidisciplinary endeavour is required, which emphasises the integration of fields such as science, law, business management, engineering and social science (Blowers, 1995: 1; Howarth, 1998: 17; Park & Chong, 1998: 1).

Students in the field of environmental management have to be educated and trained in a special way to be able to work in the frameworks as set out in the previous paragraph (Flint, 1999). These students should also be equipped with the knowledge, skills and values to think through the implications of decisions thoroughly, in order to maintain a balance with the environment. Responsible environmental management does not follow sets of rules and regulations, but involves an attitudinal change. The onus is on higher education to produce graduates with an increased and enlightened environmental awareness, who can support and make decisions in increasingly ambiguous and nebulous frameworks. (Blackman & Flemming, 1998)

This challenge has been accepted by the former Department of Geography and Environmental Studies of the University of South Africa, who took the bold step three years ago to implement an inter- and multidisciplinary, undergraduate programme in environmental management. This programme is offered exclusively by means of distance education. Since this programme is now in the third year since its inception, it was considered to be the appropriate time to bring it to general notice.

In the following section, the context provided by distance education for teaching environmental related courses is highlighted. Thereafter the focus shifts to the programme in environmental management of the University of South Africa. In subsequent sections the rationale behind the programme, the development and design of the programme and the experience gained with the programme are presented.

Attention is given to the problems which are experienced and how these problems are addressed. The results of a survey among the students who are enrolled for this programme are presented and discussed. The paper concludes with an evaluation of the programme in environmental management of the University of South Africa as well as some comments on the role of distance education in teaching environmental management.

The context of distance education

Distance education refers to a teaching and learning process in which the teacher and learner is removed from each other in time and space and typically involves a combination of different media (Sharma, 1998: 76). This form of education is no longer viewed as a "second class" option (Tahir, 2001: 22), but widely acknowledged as one of several educational methodologies (Filho, 1998a: 7).

To people not in a position to attend classes at contact education institutions, distance education is of particular relevance. Among other things it facilitates flexible learning (Filho, 1998b: 11) and allows people to organise their own time and working methods (Novo,

1998: 56). People who are employed and/or have families are examples of target groups at which distance education is aimed (Blackmore, 1998: 29).

Although distance education programmes on the environment were not very common ten to fifteen years ago, the situation has since changed. By 1998, more than one hundred environmentally related programmes were offered worldwide by means of distance education (Filho, 1998a: 7). Filho mentions that these programmes have since become important providers of environmental training, to the extent that further initiatives in this regard are encouraged as well.
Filho (1998b: 10-14), Blackmore (1998: 27-29) and Novo (1998: 53-59) indicate that distance education has specific advantages concerning training in the environmental field, especially from the viewpoint of sustainable development. Since distance education allows students to stay in their jobs while studying, the opportunity for immediate application of what is learnt, exists. Given the urgency to attend to environmental problems, this synergy between what is learnt and what is done in practice, is of particular importance.

Distance education programmes on the environment has the advantage that several target groups can be reached, varying from school teachers, government workers to professionals. Facilitated by information technology, this diversity of students allows for the horisontal exchange of ideas and therefore enhances the learning experience. This is of particular value in the environmental field, where the complexity of problems require an integrated, cross-disciplinary approach.

Other advantages of distance education in the environmental field relates to flexibility regarding the role of students and lecturers, flexibility regarding communication channels and generally speaking, lower costs. Recent developments in information technology have contributed to the enhancement of these advantages. It should be noted that although the so-called "virtual campus" may widen opportunities for some, it may not necessarily be the case for the socio-economic disadvantaged, who have traditionally been under-represented in higher education (Gladieux & Swail, 1999: 53).

Distance education on the environment however, do not only have advantages but is characterised by unresolved problems as well. Examples of these include inadequate budgetary provision of governments for distance education, lack of information on opportunities available for distance education on the environment, a reluctance of people to take part in distance education programmes and a lack of information concerning curricular aspects of environmental training through distance education.

Concerning distance education, the University of South Africa has a long history of excellence. It is currently one of eleven mega distance education universities in the world (universities with more than 100 000 students). Internationally recognised qualifications up to doctoral level are offered in six faculties. The focus now shifts to the inter- and multidisciplinary, undergraduate, distance education programme in environmental management offered by this institution.

Rationale behind the programme
During the past decade radical changes took place in many African countries, including South Africa. Many of the world's new democracies have been established in Sub-Saharan Africa

during this period (Karatnycky, 1994: 5). People in these countries now have the freedom to associate openly, elect their own representatives and have more say in how resources are managed. Effective environmental management however, is constrained by a lack of environmental awareness in general, and the lack of capacity to participate in environmental decision making (Dorm-Adzobu, 1998: 62).

In the context of environmental management, capacity development addresses the needs of society to do something about environmental problems. Academic programmes, short courses and on-the-job training constitute the most common forms of capacity development in the environmental field in Africa. According to Dorm-Adzobu (1998: 64-65) the need is to develop skills that will reduce or eliminate sectoral thinking and rather facilitate integrated environmental management. Capacity development should not be limited to the privileged, but involve all stakeholders whose perceptions, experiences, attitudes and choices are decisive in efforts to manage the environment.

The programme in environmental management which has recently been instituted by the University of South Africa, is an attempt to address the need for the development of grassroots capacity to do something about the environmental problems faced by South Africa. A survey conducted in 1999 by the former Department of Geography and Environmental Studies among South African environmental managers, provided confirmation that the need for a such a programme existed and still exists.

This survey indicated the need for a first degree in environmental management, which would equip students for entry level occupations in this field. The training of specialists are already catered for by the numerous courses in environmental management which are offered at post graduate level by other South African institutions of higher education (Nicolau & Davis, 2002). Graduates with a generalist training are required, among other things, to act as coordinators and to facilitate the involvement of the public in environmental decision making.

Legislation in South Africa makes it mandatory that any party undertaking activities that have an environment impact has to formulate environmental management plans (South Africa, 1998). Effecting this first and foremost requires knowledge of the environment. Many decisions regarding the environment are taken on community level. Participants in these processes require background regarding the environment. A first degree in environmental management seemed to be the obvious route to address these needs.

People who are concerned about the environment and would like to make a contribution to solve environmental problems, are often not in a position to attend classes at residential education institutions. For these people, the University of South Africa, which offers tuition exclusively via the medium of distance education, is an obvious choice.

Development and design of the programme

The programme in environmental management of the University of South Africa is offered as a Bachelors degree over a period of at least three years. It can be taken either as a Bachelor of Arts (BA) or a Bachelor of Science (BSc) degree with specialisation in environmental management. It commenced its first intake in 2000 after two years of planning, during which industry was consulted and curriculum design and development took place. This programme

provides a broad-based education which not only equips students for the labour market, but also serves as a platform for life-long learning.

Philosophy
The design of this programme has been determined by the philosophy that environmental problems need a holistic treatment, and that people who wish to work in this field have to be educated and trained accordingly. Armstrong & Rutherford (1999: 353) states that the traditional reductionist approach of science tends to underemphasise this important quality. Since the incompatibility of different viewpoints is regarded as a major obstacle in the resolution of environmental problems, the adoption of a holistic approach is of particular importance.

Another important consideration is the realisation that students not only require knowledge about the environment and environmental problems, but also need skills to do something about it. Above all, the programme should enable students to adopt a responsible and informed opinion on the environmental issues which they will come into contact with. Ali Khan (1995: 7) highlights the need for the higher education sector to enable students to be environmentally responsible citizens.

This programme views environmental management as a process whereby human activities are planned in order to sustain the quality of humankind's total world. This implies that it is not the environment that is managed, but human decision making about the environment. The term "environment" does not refer to only the natural or only the human made environments, but to both. In line with Bryant & Wilson (1998), this programme adopts an inclusive understanding of what environmental management is. A broader appreciation of environmental problems and their solutions can therefore be obtained.

Purpose
As stated in the marketing brochure (Department of Geography & Environmental Studies, undated: 5), the purpose of this programme is to deliver competent emerging professionals with a focussed knowledge of the human impact on the natural, socio-economic and cultural environments. Graduates furthermore have to possess a sound understanding of the processes structuring both the natural and human made environments and have to acquire the skills to make a contribution to problem identification and solving in this regard. Another purpose is to provide South Africa (and the global community) with graduates that have a holistic approach. In the final instance these graduates have to be able to act as responsible and knowledgeable stakeholders in environmental decision-making and be able to participate in the implementation of environmental management plans on different levels.

Structure
Figure 1 presents a model of the programme in environmental management of the University of South Africa. The core of the programme consists of a number of modules in Geography on the first, second and third levels. Geography constitutes the only major for this programme. This core is supplemented with six other groups of modules, some of which have to be taken by all students. A selection from a number of optional modules is allowed as well.

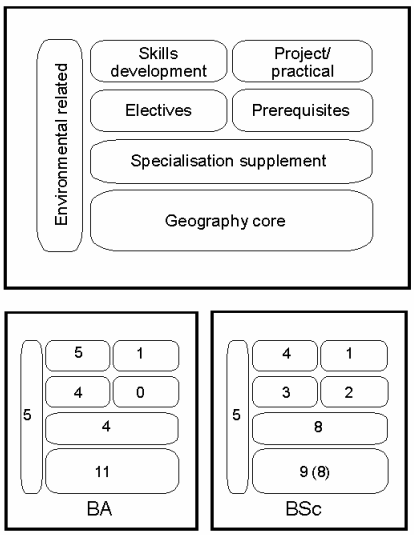
Geography is used as vehicle to set the scene and also provides the holistic, integrative approach. The specialisation modules allow students to obtain experience in related fields of

expertise. Some of these specialisation modules have prerequisites, which also have to be provided for. The environmental modules serve not only to expand the student's insight but also to equip them with more background for their careers in environmental related jobs.

Without the necessary skills to identify and solve environmental problems and to play a valuable role as a member of an environmental management team, graduates will not be of much use in practice. The programme therefore includes a number of modules which are focussed on the development of these skills. In order to ensure credibility, a practical/project module is provided for as well.

The programme differentiates between BA and BSc. The reasoning behind this is to focus the training of the BA student on the human impact on the social environment, while the BSc student concentrates on the human impact on the biophysical environment. Both BA and BSc students take Geography as major and also do the modules focussed on the environment.

The allocation of modules between the different components comprising the programme is shown in the bottom part of Figure 1 for respectively the BA and the BSc.



Figuree 1.
The components of the programme in environmental management. The number of modules comprising the various components are indicated in the bottom part of the figure (BA-left; BSc-right).

Content
The Geography core of the programme focusses on sustainability and environmental management. A new syllabus was developed, characterised by the integration of Physical and Human Geography, a thematic approach, a global, continental and national focus on respectively the first, second and third levels, and skills integrated with theory (Vlok & Zietsman, 2001). Examples include the first level module "World issues: a geographical

perspective", the second level module "People and the natural environment: use and impact" and the third level module "Environmental evaluation and impact assessment".

Most of the modules in the environmental group did not exist previously and were developed specifically for this programme, mostly by departments other than Geography and Environmental Studies. The topics addressed include environmental ethics, environmental politics, environmental law and environmental economics. Concerning the specialisation modules, BSc students have a choice between Chemistry, Botany and Zoology. BA students, on the other hand, can enhance their expertise with modules in Communication Science, Anthropology, Archeology and Environmental Education, to mention a few.

In the skills group, introductory modules deal with statistics, computer literacy and language ability. The module "Projects and programmes as instruments of development" is on a more advanced level. It should be noted that two of the Geography "core" modules also focus on skills development (topics include maps, aerial photographs, satellite images and geographical information systems). In addition, BA students do a project, while BSc students do a practical in their respective specialisations (Botany, Chemistry, Zoology).

The electives allow both BA and BSc students to further their expertise concerning the social sciences and/or skills required by an environmental manager. In this category BA students choose four modules, while BSc students choose only three. Interesting options, to mention a few, include "Introduction to the business world", "Ecotourism", "Environmental psychology", "Anthropological study of culture in a multicultural context" and "Interpersonal skills in diverse contexts".

Teaching model

Despite the constraints of distance education, the programme advocates a student-activating approach (Wemmehove & de Groot, 2001: 281). The focus is on intrinsic motivation and understanding, and attempts to relate parts to each other and concepts to real life. Students are encouraged to make their studies meaningful to their own lives. This corresponds to a "deep approach" to learning (Chin & Brown, 2000), which is in line with the latest thoughts concerning instruction (Glasersfeld, 1989; National Research Council, 1999; Novak, 1988).

The Geography core of the programme serves as example of how the latter aims are achieved. The UK Open University's method of course teams were used to develop the teaching materials for the Geography modules (Rowntree, 1990; Zietsman & Vlok, 2002). Learning outcomes are clearly stated for every module, study unit and subsection. Activities and self-tests are included so that students can practice skills, demonstrate their mastery of knowledge, explore their life-worlds and examine their attitudes.

The teaching model utilises not only summative assessment, but also formative and integrative assessment. Formative assessment is achieved by provision of feedback on activities and self-tests. This feedback may constitute the clarification of ideas, take the form of worked examples, highlight problems areas, ask critical questions and/or present different perspectives. This gives students the opportunity to revise their thinking, and serves as an aid in their knowledge construction efforts.

Integrative assessment is achieved by provision of the project which BA students have to do. This module is based on an environmental management project. It aims to give students the opportunity to integrate the knowledge, skills and values which have been developed during the entire study period and to apply these to a real problem (Department of Geography & Environmental Studies, undated: 43).

Issues

The most important issue during the development of the programme was the barriers between departments and faculties. These barriers are characteristic of most rigidly structured institutions of higher education. As a result inter-departmental and inter-faculty cooperation is virtually non-existent. Departments and faculties are likely to show territorial behaviour and protect their own turf. This phenomenon, referred to as the "shadow curriculum" (Jucker,2002: 15), can be a major constraint in the implementation of education for sustainability.

Related to this is the straightjacket of monodisciplinary education which is still practised widely, also in the University of South Africa. This approach is not suitable for education and training in the field of environmental management, which requires an inter- and multidisciplinary approach. The university community first had to be convinced that such an approach is indeed viable and would not compromise standards. Ground-breaking work also had to be done to dismantle barriers and foster a climate of cooperation between departments and faculties.

The programme in environmental management was born after many hours of networking and deliberation. The general concern about the environmental issues of the day proved to be the decisive factor. The former Faculty of Arts and the Faculty of Science were the most responsive in this regard. Both a BA and a BSc degree with specialisation in environmental management could therefore be instituted. Although not full partners, the Faculties of Economic and Management Sciences, Law and Education agreed to contribute modules to this programme. The end result constituted cooperation between five faculties and a large number of departments.

The design of the programme presented a significant challenge. The issue was how to maintain a balance without cramming to many modules in the curriculum. The BSc proved to be problematic due to the large number of prerequisites. To a lesser extent the same problem holds true for the modules in environmental economics, law, ethics and politics, which require some background in their respective disciplines as well. In some cases this problem was solved by the relevant departments, who agreed to develop theses modules in such a way that it would be self-contained.

In the former Department of Geography and Environmental Studies, who initiated the process, some issues also had to be addressed. The Geography curriculum had to be remodelled to provide an environmental management focus. Geography however, had to maintain its status as a major for both the generic BSc and BA. Other issues which had to be addressed include a university decision to modularise and semesterise, and implement outcomes based education (Kilfoil: 1999; UNISA: 1998).

Most of these issues were addressed and solved in the one or the other way. The decisive factor however, was the determination of the former Department of Geography and Environmental Studies to make a visible contribution to education for sustainability, and not to wait for another department or institution to do it. As Jucker (2002: 16) aptly states concerning education in the environmental field: "There is only one way: get up and get going".

Experience with the programme in practice

Since the programme in environmental management of the University of South Africa has only been instituted in 2000, no graduates has yet been delivered. Conclusive findings on the success/failure of the programme at this stage will therefore be premature. The purpose of this section is to provide only a preliminary report on the experience thus far. This is based, among other things, on student numbers, the spatial distribution of students as well as other characteristics of the student population.

In addition, some feedback was obtained during May 2002 by conducting a survey among the students enrolled for this programme. A questionnaire was compiled and distributed among a sample of the students. The sample consisted of only those students with email addresses. This category comprises 135 (or 51,9%) of the students. Of these, 56 students returned usable questionnaires. The email addresses for 23 students were faulty, and two of the returned questionnaires could not be used. In terms of the total enrollment, 21,5% of the students were involved in this survey.

Enrollment trends

Data supplied by the Bureau for Management Information of the University of South Africa (Table I) indicates an interesting trend in the enrollment for the programme in environmental management. While BSc enrollments approximately doubled every year from 200 to 2002, BA enrollments show a dramatic increase in 2001, followed by an even more dramatic decrease in 2002. The reason for this is not clear, but after the 2002 mid-year registration the picture might look different. Currently 260 students are enrolled for this programme, 80 for the BSc and 180 for the BA. Apart from the slump in new BA enrollments for 2002, the overall picture is encouraging and provides the basis for continuation and further growth.

Table I.

Enrollments for the programme in environmental management (as on 1 March 2002).

Specialisation	**New enrollments**			**Current total**
	2000	**2001**	**2002**	
BA	48	126	6*	180
BSc	23	24	33	80
Total	71	150	39*	260

* Final enrollment for 2002 not available due to mid-year registration

Spatial distribution of students

Data supplied by the Bureau for Management Information of the University of South Africa (Table II) indicates that the programme in environmental management attracts students from all over South Africa, and even world-wide. As can be expected, the greatest proportion of students occurs in the more densely populated provinces. This distribution pattern is encouraging, and shows that this programme has a far-reaching impact and addresses a real need in society.

Table II.

Spatial distribution of students (based on enrollments as on 1 March 2002).

Province/area	**BA**	**BSc**	**Total**	**Percentage (of 260)**
Foreign countries	10	6	16	6,2
Eastern Cape	9	1	10	3,9
Free State	7	2	9	3,5
Gauteng	57	28	85	32,6
Kwazulu Natal	29	16	45	17,3
Mpumalanga	13	6	19	7,3
North West	16	6	22	8,5
Northern Cape	0	1	1	0,4
Northern Province	14	4	18	6,9
Western Cape	25	10	35	13,4
Total	180	80	260	100

Student profile

Information on the student profile was obtained with the aid of the survey conducted among students enrolled for the programme. Concerning employment, 91,1% of the respondents indicated that they have the one or the other type of job. In line with this, 73,2% of the respondents indicated their inability to attend classes at a contact learning institution as one of their reasons for enrolling at the University of South Africa. The majority of respondents however, indicated more than one reason in this regard. Other reasons which attracted relatively high scores are "this degree is not offered at other institutions at undergraduate level" (26,8%) and "the University of South Africa is well-known for its high academic standards" (30,4%).

One of the reasons most often mentioned by the respondents for enrolling specifically for an environmental related degree is "I have an interest in the environment" (71,4%). More than one reason however, was mostly offered. Other reasons which attracted relatively high scores include "job/career related reasons" (55,4%), "I want to improve my academic qualifications" (51,8%) and "I would like to contribute to solve environmental problems" (48,2%). Funding for their studies comes primarily from own savings (60,7% of respondents), while a significant proportion (17,9%) receives financial support from their employers.

Student progression

Since the students enrolled for this programme mostly study part-time, few will complete their studies in the minimum period (three years). As to be expected in a distance education environment, students will typically take at least five years to complete, and some even longer. It comes as no surprise that the respondents who enrolled in 2000 have on average obtained credit for only 8 modules after two years of study. The respondents who enrolled in 2002 have on average obtained credit for only 5 modules after one year of study.

Students' views

Six of the twenty questions in the questionnaire were used to gain insight in students' views concerning the programme in environmental management. The usefulness of the programme in view of career objectives is rated as "relevant" or "highly relevant" by 75% of the respondents. The Geography core of the programme is rated slightly higher, with 82% of the respondents of the opinion that it is "relevant" or "highly relevant".

Concerning positive aspects of the programme, the results in Table III indicate that "increased environmental awareness and knowledge" receives relative high scores from both BA and BSc respondents. Both groups also rate "relevance with regard to career" relatively high. The results in Table IV indicate that a large proportion of the respondents have no negative associations with the programme so far. It should be noted however, that a fairly large proportion of both groups indicates that "administrative problems" is an issue which needs attention.

Table III.
Positive aspects about the programme in environmental management indicated by students in response to an open ended question.

Positive aspects indicated by students	**Relative score (%)**	
	BA	**BSc**
Question not answered at all	3,2	3,1
"None" indicated	6,5	12,5
Increased environmental awareness and knowledge	41,9	34,4

Program structure promotes integration	9,7	12,5
Relevance with regard to career	12,9	18,8
Good study material	3,2	12,5
Boosting self-development and -esteem	8,1	3,1
Distance education context	12,9	3,1
Other	1,6	-

Table IV.
Negative aspects about the programme in environmental management indicated by students in response to an open ended question.

Negative aspects indicated by students	**Relative score (%)**	
	BA	**BSc**
Question not answered at all	6,3	13,8
"None" indicated	33,3	31,1
Lack of interaction	8,3	6,9
Administrative problems	20,8	13,8
Problems with specific modules	16,7	10,3
Problems with study material	12,5	13,8
Other	2,1	10,3

Impact in the university

The contribution to curriculum greening can be regarded as the most notable impact of the programme in environmental management. The modules in environmental economics, law and ethics can be taken as examples in this regard. These modules have not existed before, and were developed specifically for this programme. These modules however, are not reserved for the students of this programme only, and as a result many other students also started to enroll for them.

On 2002-05-08 the enrollment for environmental economics totalled 98 students. Of this 32% constitute enrollments from the programme in environmental management. Only 15% of the

enrollments for environmental ethics come from the programme in environmental management. This low contribution can probably be ascribed to the placement of this module on the third level of the programme, which most students have not reached yet. For environmental law the effect is similar but less dramatic: of the 43 students enrolled for this module, 77% come from the programme in environmental management.

Education for sustainability has therefore attained both visibility and credibility in the university. A spinoff of this increased visibility was that the former Department of Geography and Environmental Studies was approached by the Faculty of Economic and Management Science to develop two environmental modules for the BCom in tourism management. A module titled "The geography of tourism", which deals with the environmental impacts of tourism, as well as a module titled "Ecotourism" was therefore developed. Slowly but surely the environmental message is thus spreading and gaining more ground.

Discussion and concluding remarks

Study programmes in the environmental field are not something new, neither the idea to offer these by means of distance education. The programme in environmental management of the University of South Africa offers the advantage of a holistic approach, emphasising the interconnectedness between phenomena. The Geography core of the programme fulfills an important role in this regard. To this end the Geography syllabus has been completely remodelled to make provision for an environmental management focus.

Whereas qualifications in environmental management are mostly offered at the post-graduate level, this is an undergraduate programme. The aim however, is not to produce specialists, but generalists who can contribute to the integration and co-ordination of the disciplines typically involved in environmental management endeavours. This programme caters for people who cannot attend classes at contact education institutions and have to rely on distance education to further their studies.

The survey conducted among the students enrolled for this programme shows that most of them have jobs. They have the opportunity to contextualise what they learn into their work life. To support them in this regard, the teaching material contains numerous study tasks, activities and self-tests. Formative assessment in the form of feedback and re-consideration, as well as integrative assessment in the form of a project/practical forms part of the package. This all serves to enhance the learning experience and to empower students to take their learning in their own hands.

Currently 260 students are enrolled for the programme in environmental management. These students are spread across South Africa, with a few in other parts of the world. This indicates that this programme addresses a definite need in the South African society for some form of higher education with regard to the environment. The potential therefore exists to make a substantial contribution to education for sustainability. The distance education environment acts as limiting factor but at the same time creates some exciting possibilities.

The students generally view the programme in environmental management in a positive light. In the survey which was conducted, respondents regard "increased environmental awareness and knowledge" and "relevance with regard to career" as two positive aspects. Although a significant proportion of the respondents had no negative comments at all, "lack of

interaction", "administrative problems", "problems with specific modules" and "problems with study material" are regarded by some respondents as areas of concern.

The barriers between departments and faculties constrained the institution of the programme in many ways. Since this programme has a strong inter- and multidisciplinary character, cooperation between departments and faculties is of crucial importance. The general concern about environmental issues, combined with networking and behind-the-scene deliberations, turned the scale. The end result is a significant contribution to curriculum greening, together with academic credibility for environmental related education.

Despite some shortcomings, the programme in environmental management of the University of South Africa is an honest attempt to contribute to education for sustainability. The survey which was conducted among the students indicates that this goal has to a large extent been achieved. A final evaluation will only be possible once the first graduates have been delivered. In the mean time, the preliminary feedback obtained from the student survey can be used to streamline and refine the programme.

References

Ali Khan, S. (1995), *The environmental agenda (Taking responsibility - promoting sustainable practice through higher education curricula): Overview*, Pluto Press, London.

Armstrong, P. & Rutherford, J. (1999), "An international environmental study programme: the International Baccalaureate Environmental Systems course", *The Environmentalist*, Vol. 19, pp. 349-360.

Barrow, C.J. (1999), *Environmental management: principles and practice*, Routledge, London. Blackman, D.A. & Fleming, T.G. (1998), "Environmental education: where does it fit in decision-making?", in Park, P.D., Blackman, D.A. & Chong, G. (editors), *Environmental education and training*, pp. 82-92, Ashgate, Aldershot.

Blackmore, C. (1998), "Environmental education through distance education and open learning in the UK ", in Filho, W.F. & Tahir, F. (editors), *Environmental education, communication and sustainability, vol. 2: Distance education and environmental education*, pp. 21-42, Peter Lang, Frankfurt.

Blowers, A. (1995), "Key issues", in Watkin, G., Wanklyn, M. & Wylie, V. (compilers), *The environmental agenda (Taking responsibility - promoting sustainable practice through higher education curricula): Humanities and social sciences*, pp. 1-4, Pluto Press, London.

Bryant, R.L. & Wilson, G.A. (1998), "Rethinking environmental management", *Progress in Human Geography*, Vol. 22, No. 3, pp. 321-343.

Chin, C. & Brown, D.E. (2000), "Learning in science: a comparison of deep and surface approaches", *Journal of Research in Science Teaching*, Vol. 37, No. 2, pp. 109-138.

Department of Geography and Environmental Studies (undated), *BSc degree / BA degree with specialisation in environmental management*, University of South Africa, Pretoria.

Dorm-Adzobu, C. (1998), "Institutionalizing environmental management in Africa", in Veit, P. (editor), *Africa's valuable assets - a reader in natural resource management*, pp. 27-70, World Resources Institute, Washington.

Filho, W.F. (1998a), "Introduction", in Filho, W.F. & Tahir, F. (editors), *Environmental education, communication and sustainability, vol. 2: Distance education and environmental education*, pp. 7-8, Peter Lang, Frankfurt.

Filho, W.F. (1998b), "Environmental education and distance education", in Filho, W.F. & Tahir, F. (editors), *Environmental education, communication and sustainability, vol. 2: Distance education and environmental education*, pp. 9-20, Peter Lang, Frankfurt.

Flint, R.W. (1999), *A new paradigm for interdisciplinary science education*, http://www.eeeee.net/ee00028.htm.

Gladieux, L.E. & Swail, W.S. (1999), "The virtual university and educational opportunity: panacea or false hope?", *Higher Education Management*, Vol. 11, No. 2, pp. 43-56.

Glasersfeld, E. (1989), "Cognition, construction of knowledge, and teaching", *Synthese*, Vol. 80, pp. 121-140.

Hillary, R. (ed.) (1995), *The role of the environmental manager*, Stanley Thornes, Cheltenham.

Howarth, W. (1998), "The essence of an environmental law education", in Park, P.D., Blackman, D.A. & Chong, G. (editors), *Environmental education and training*, pp. 17-26, Ashgate, Aldershot.

Jucker, R. (2002), "Sustainability? Never heard of it! Some basics we should'nt ignore when engaging in education for sustainability", *International Journal of Sustainability in Higher Education*, Vol. 3, No. 1, pp. 8-18.

Karatnycky, A. (1994), *The comparative survey of freedom, 1993-1994: Freedom in retreat*, Freedom House, Washington DC.

Kilfoil, W.R. (1999), "The comfort zone stops here: OBE, the NQF and higher education", *Scrutiny*, Vol. 24, No. 1, pp. 3-15.

National Research Council (1999), *How people learn: brain, mind, experience and school*, National Academy Press, Washington, DC.

Nicolau, M.D. & Davis, N.C. (2002), "Restructuring South African Geography", *South African Geographical Journal*, Vol. 84 (special issue), in print.

Novo, M. (1998), "Environmental education at a distance: a tool for sustainable development", in Filho, W.F. & Tahir, F. (editors), *Environmental education, communication & sustainability, vol. 2: Distance education and environmental education*, pp. 43-69, Peter Lang, Frankfurt.

Park, P.D. & Chong, G. (1998), "Environmental education and training: an introductory essay", in Park, P.D., Blackman, D.A. & Chong, G (editors), *Environmental education and training*, pp. 1-10, Ashgate, Aldershot.

Rowntree, D. (1990), *Teaching through self-instruction: how to develop open learning materials*, London, Kogan Page.

Sharma, M. (1998), "Environmental education through distance education in a perspective from developing countries", in Filho, W.F. & Tahir, F. (editors), *Environmental education, communication and sustainability, vol. 2: Distance education and environmental education*, pp. 71-85, Peter Lang, Frankfurt.

South Africa (1998), *National Environmental Management Act 107 of 1998*.

Tahir, F. (2001), "Distance education, environmental education and sustainability: an overview of universities in Commonwealth Asia", *International Journal of Sustainability in Higher Education*, Vol.2, No. 1, pp. 21-37.

UNCED (1992), *Agenda 21*, United Nations Conference on Environment and Development, Rio de Janeiro.

UNISA (1998), *Tuition policy*, UNISA, Pretoria.

Van Weenen, H. (2000), "Towards a vision of a sustainable university", *International Journal of Sustainability in Higher Education*, Vol. 1, No. 1, pp. 20-34.

Vlok, A.C. & Zietsman, S. (2001), "Adapt or die: the case of South African Geography at tertiary level", paper presented at the *Fourth Biennial Conference of the Society of South African Geographers*, Goudini-Spa, 2-5 July.

Wemmehove, R. & de Groot, W.T. (2001), "Principles for university curriculum greening: an empirical case study from Tanzania", *International Journal of Sustainability in Higher Education*, Vol. 2, No. 3, pp. 267-283.

Zietsman, S. & Vok, A.C. (2001), "Old wine in new bottles: the case of Geography teaching at the University of South Africa", paper presented at the *Third Conference of the National Association of Distance Education Organisations of South Africa*, Johannesburg, 28-29 August.

Author details

Name:
Rudi W. Pretorius

Affiliation:
Department of Anthropolgy, Archeology, Geography and Environmental Studies
University of South Africa
PO Box 392
Pretoria
0003
South-Africa

Contact details:
INT +27+12 429-6013/6527
FAX 429-3221
E-Mail: Pretorw@unisa.ac.za

Return to Contents

31. Curriculum Development and Institutionalization of a Course in Environmental Education for Pre-service Teachers – A Case study from India

M. J.Ravindranath

Centre for Environment Education, Bangalore, India.

ABOUT THE AUTHOR

Dr.M.J.Ravindranath works as a Senior Scientist (Programme Coordinator) at the Centre for Environment Education (CEE), Bangalore, India. With a background in biological sciences and education, his areas of concentration at CEE have been Curriculum Development and Teacher Education. In the last 17 years of his stay at CEE, he has been instrumental in planning, implementing and evaluating several national and international projects related to school children, teachers and teacher educators. Cluster Approach to Environmental Education, a communication strategy, evolved by him is popularly used by CEE for training teachers in the country. He has published slightly more than 70 academic papers in national and international journals and presented conceptual and research articles in several academic forums.

Key words

Pre-service teacher training
Curriculum Development Process
Professional Development Strategy
Action research
Validation
Institutionalization

Introduction

Critical global environmental issues such as loss of tropical forests and biodiversity, increasing emissions of green house gases, vast scale atmospheric contamination, increasing global temperature, alarming rise of toxic chemicals in consumer goods, etc.,

have all pushed forward the need for *Sustainable Development* as an international and national priority. The message that "it is possible to have development without jeopardizing the ecosystem or resources base for the future" put forth by Brundtland Report (WCED 1987) and Agenda-21 (Report of the UNCED 1992) has been greatly appreciated all over the world. As a result, Sustainable Development or Environmental Sustainability has been promoted as a new planning agenda in many countries (Philip and Maria, 1999). India is no exception to this. The National Conservation Strategy and Policy Statement on Environment and Development, Government of India, 1992, endorsing Sustainable Development, has recommended several actions at the national and state levels. Creating environmental awareness through education has been one of them.

The Chapter 36 in Agenda-21 recognizes ***Education*** as a critical input for promoting sustainable development and improving the capacity of the people to address environment and development issues. The guide to Agenda-21, 1993 reiterates that *Education* should, in all disciplines, deal with the dynamics of both the physical/biological and socio-economic environment and human development, including spiritual development. It should employ both formal and non-formal methods and effective means of communication.

Being a signatory to many of the International Protocols and Conventions on Environment, India, in the last few decades, has made significant efforts to get environmental education more formally established in the general and technical education curriculum. The National Policy on Education (1986), the Supreme Court's Directive on infusing environmental messages in to the school and college curriculum (1992), the most recent National Curriculum Framework for School Education (NCERT 200O) are testimony to this.

As corollaries, concerted efforts have been made to introduce Environmental Education (EE) at all levels of education and augment it with development and dissemination of appropriate curricula, quality teaching-learning materials, capacity building in teachers and sustained follow up and monitoring.

At the pre-service teacher training, while a few universities in India have introduced EE as an elective or optional subject at the secondary school teacher training (Bachelor of Education or B.Ed), a few others have integrated it as an exclusive chapter under one of the foundation papers, "Education in Emerging India". The National Council of Teacher Education (NCTE) and University Grants Commission (UGC), apex bodies for teacher education and higher education respectively, have also adequately emphasized inclusion of EE in the teacher education curriculum.

Considering the efforts made to institutionalize EE at the school level and the consequent need of adequate teacher preparation for bringing in environmental infusion at the school level, the Centre for Environment Education (CEE), Ahmedabad, India, a national institution, supported by the Ministry of Environment and Forests, Government of India, undertook a systematic attempt to develop and validate a course in EE for implementation in B.Ed colleges in Karnataka.

This paper presents the details of the effort and its significance in the area of curriculum development. It is earnestly hoped that the strategy *"Professional Development Process"* adopted for the course development and its institutionalization serves as a learning experience for many other universities/organizations involved in similar work.

Genesis of the EE Curriculum

The Curriculum development process began in the second half of 1995 with the primary goal of assisting the teacher educators in Karnataka State (a state in South India with a population of 55 lakhs and having 64 B.Ed colleges affiliated to six universities in Karnataka) in evolving a course in Environmental Education and incorporating it as a part of the teacher education curriculum. The course was aimed at preparing student teachers (teacher trainees) well informed in the content and methodologies of Environmental Education. The entire process of curriculum development was guided by the following considerations.

- The EE curriculum should be relevant to both science and social science streams of student teachers and must reflect major principles and concepts in EE as outlined in some of the national and international conferences. It should be cross-disciplinary in approach and relate to local environmental problems/issues of Karnataka.

- The curriculum should have more emphasis on the pedagogical aspect of EE, rather than the usual emphasis on the ecological/ environmental content, and facilitate capacity building in teacher trainees to plan, organize, evaluate and integrate EE activities/ programmes in their specialized areas of teaching.

- The curriculum development process should not be just an exercise in listing topics and subtopics in Environmental Education (EE) and prescribing it for inclusion in teacher education. Rather, the entire process should be a capacity building exercise in curriculum development for teacher educators, involving a process of reflection, analysis, consolidation, trialing and evaluation. Such a process must visualize teacher educators as "active partners" in curriculum development than as "passive receivers" of centrally produced curriculum or as Fien (1999) puts it 'technicians" applying the curriculum developed by a few experts.

Curriculum Development Strategy

Quite contrary to the usual practice of top-down or centrally driven approaches of course development followed in many universities, the strategy adopted in the present case is based on the Action-research model advocated by Hart (1990) and Robottam (1987). The significance of the strategy lies in its approach to building capacities in teacher educators in curriculum construction, its tryout and renewal. The strategy involved a Professional

Development Process (Fien, 1993) calling for Reflection, Analysis, Consolidation, Trialing and Evaluation on the part of teacher educators.

Stage I: Development of the curriculum

As a part of the curriculum development process, during the academic year 1995-96, a broad curriculum framework in EE for teacher preparation at secondary level was developed along with the instructional materials. The curriculum framework comprised contents, teaching-learning methodologies, evaluation and resources needed for transacting the EE curriculum.

The course contents were drawn by examining a) the objectives of EE stated at the national and international forums, b) major environmental problems and issues of India, with special reference to the state of Karnataka (since the course was targeted for B.Ed colleges in Karnataka), c) important concepts needed for understanding and addressing environmental problems/issues, d) the contents of the secondary school textbooks in science and social sciences prescribed by Government of Karnataka, for bringing in necessary correlation and relevance, e) teaching competencies at secondary school level, f) EE materials developed by UNESCO-IEEP, NCERT, CEE, etc. and g) efforts made at the national and state level by government and non-governmental agencies in environmental conservation. The various steps followed in developing the curriculum are provided in Figure 1.

take in Fig.I

The developed curriculum included five units.

Unit–1: Our Environment
Unit-2: Processes in Environment
Unit-3: Resources, Problems and Management
Unit-4: Pedagogy in Environmental Education
Unit-5: Evaluation in Environmental Education

(Details of the content covered under each unit is provided under 'Course contents' in appendix-1)

take in Appendix-I

To teach these units, five instructional modules were conceived. These modules were aimed to help the teacher educators in transacting the contents of the course effectively. Each module includes specific objectives, details of the concepts dealt in the unit, description of the teaching-learning methodologies and items for evaluation and feedback. In addition, each module also includes texts of transparencies, additional

information on local environment issues, activity sheets and case studies for the teacher educators to use for transacting the course. Teacher educators from nine B.Ed colleges (Project colleges) representing all the six universities in Karnataka participated in the development of the EE curriculum and instructional materials and its trial in their respective colleges. Description of each of the module is given in appendix-II

take in Appendix-II

Stage II: Try out of the Curriculum

First Trial

The developed curriculum along with the teaching-learning modules was tried during the year 1995-96 by the project colleges as part of their regular B.Ed instruction and was assessed for effectiveness and practicality. In each of the project college, the course was tried out by the teacher educators on a group of 25 to 30 student teachers (teacher trainees) who volunteered to undergo the course. In all, 220 teacher trainees from the nine B.Ed colleges underwent the course and provided feedback for its improvement. In each college, the trainees carried out several action programmes as part of their course work. These included:

- Formation of eco-clubs
- Organizing environmental exhibitions
- Maintaining plants in their own college campus
- Preparation of environmental models
- Organizing radio programmes on local environmental issues
- Preparation of charts, posters, flip charts, etc., on environmental topics
- Preparation of herbarium albums
- Maintaining environmental bulletin boards
- Developing environment specific lesson plans
- Tree plantation and community cleaning as part of citizenship training camps
- Surveying the local environment and preparing environmental reports

Second Trial

The course materials developed during the first trial were scrutinized by subject and language experts and revised accordingly. In order to validate the revised course for its practicality and feasibility, during the academic year 1997-98, the course was once again trialed in actual classroom situations in seven more B.Ed colleges, representing all the six universities in the state. In each college, more than 20 to 25 student teachers undertook the course as part of their regular B.Ed course.

Validation of the Course

The course was evaluated for trainees' learning, relevance, appeal and practicality. learning, at the end of each unit, was assessed using criterion tests. It is worth mentioning that almost all the trainees (n=120) had obtained more than 70 per cent in the criterion tests, endorsing a gain in their environmental knowledge and understanding. Besides the criterion tests, the trainees were also assessed for their assignments and practicals. In each of the seven project colleges, the trainees also completed at least two project assignments.

Student teachers' reactions on the course

In order to obtain reactions towards the course, a detailed questionnaire covering several aspects of the course was administered on all the trainees who had participated in the 2nd trial. The questionnaire included 32 items and pertained to the following aspects.

1. Achievement of EE objectives
2. Scope and significance of the course
3. Structure and design of the course
4. Applicability of the course for classroom teaching
5. Teaching methodologies employed for transacting the course
6. Teaching methodologies most liked by the student teachers
7. Overall impressions and Impact
8. Difficulties encountered

A few important findings as revealed from the trainees' responses are:

- All the four components of the course, viz., theory, practicum, assignments and field trips had helped them to realize the various objectives of environmental education – Education *about*, *in* and *for* Environment;

- The EE course had broadened their understanding of the environment, issues and problems and helped them to attain the various objectives of the course;

- In the context of EE made as an integral part of the school curriculum, the course was found useful in equipping pre-service teachers with the necessary knowledge and skills for infusing environmental perspective.

- The environmental messages such as interdependence, balance in nature, conservation of natural resources, sustainability, equity, governance, etc. learnt during the course are extremely relevant for teaching EE at the school level and promoting environmental awareness amongst school students.

- The course helped the trainees to develop favorable attitudes and feelings towards environment and forming individual and collective views on such aspects as conservation of biological diversity, planning for sustainability, governance and political will, role of education for achieving environmental ethic, etc.

- The course helped the trainees to develop confidence in organizing various EE activities such as:

- Nature games
- Nature Walks
- Environmental projects
- Field trips
- Slide shows on environment and wild life
- Excursions to national parks
- Brainstorming as part of environmental problem solving
- Street plays and Puppet shows on environmental themes

- On the various teaching methods used for transacting the course, the following were found very innovative and useful by the trainees for classroom teaching.

- Role play
- Project method
- Brain storming
- Environmental games
- Field trips
- Problem solving approach
- Nature walk
- Case study approach
- Issue analysis approach

Teacher Educators' reactions on the course

Views and opinions of the teacher educators who transacted the course revealed that they had found the course relevant and interesting to their trainees. They also opined that the teaching-learning modules were helpful in transacting the course and in organizing EE activities. A few reactions quoted from teachers' reactionnaire are presented below.

- "The EE course in general was an absorbing study for all the students who participated in the project. The curriculum can be effectively adopted in the B.Ed course as one of the additional subjects. It may not be unreasonable to say that it should be made compulsory subject for all the teacher trainees"

- "Environmental Education is the need of the hour. The Centre has taken the right step in this direction by initiating the EEPT course at B.Ed level. I feel proud to be involved in the project. I feel that the course must be introduced as one of the

compulsory papers for teacher trainees in all the Universities in India. As my vision, I go a step further and say that it should become one of the Foundation Papers at B.Ed.

- " The EE course was definitely useful to all the student teachers and faculties. It requires honest, well-planned hard work to master the subject matter and skills of teaching. Environmental Education course should be made compulsory at pre-service teacher training. This will help spread EE messages to all students. Efforts should be made to include EE in teacher education".

Stage III: Training of Teacher Educators in Karnataka State

Appreciating the course and its impact, the Department of Education, Government of Karnataka offered CEE all administrative and financial support to train at least two teacher educators (one from social science and one from science background) from all the 64 B.Ed colleges in the state in the effective implementation of the course. As part of this, intensive training workshops were held during the years 1997 and 1998 to build capacities in teacher educators in effectively implementing the course at B.Ed.

Institutionalization of the course by the universities in Karnataka

It is highly satisfying to mention that the developed course has been offered as an elective subject (optional subject) in many B.Ed colleges affiliated to Universities of Karnataka and the faculties are using the instructional materials for teaching the various units in the course. In some universities, the developed course and the instructional modules have been used by Master of Education (M.Ed) and Master of Philosophy (M.Phil) students for their dissertations and project work.

Conclusion

The development of the EE course and its institutionalization in teacher training institutions in Karnataka has lot of significance when one considers the efforts made in the country to revitalize teacher education to address environmental issues/problems. The Professional Development Strategy adopted to develop the EE curriculum makes a significant departure from the traditional and centrally driven approaches to curriculum development. The strategy elicits active participation and links professional and curriculum development, encouraging the teacher educators to bring in the curricular needs as they perceive, and there by own the curriculum they have developed.

The developed course is based on three closely integrated aspects, namely, Education *about*, Education *in* and Education *for* the environment. The contents of the course are interdisciplinary and are woven in such a way that teacher trainees, through out the course, get opportunities to explore their surroundings, understand and reflect on the local environmental issues. The course makes use of a variety of teaching methods – conventional and innovative – providing teacher trainees opportunities and insights into the plethora of EE activities and programmes.

References

Hart. P (1990). Rethinking teacher education environmentally in monographs in Environmental Education and Environmental studies as quoted in the Report of the Learning for a Sustainable Environment, National Institute for Educational Research, Tokyo, Japan

John Fien (1993). Teaching for a sustainable development, Griffith University, Brisbane

John Fien, etal (2001). An action research network as a strategy for educational change: The learning for a sustainable development project, Journal of Educational Change 2, 207-221

National Policy on Education, Ministry of Human Resources Development, Government of India, 1986.

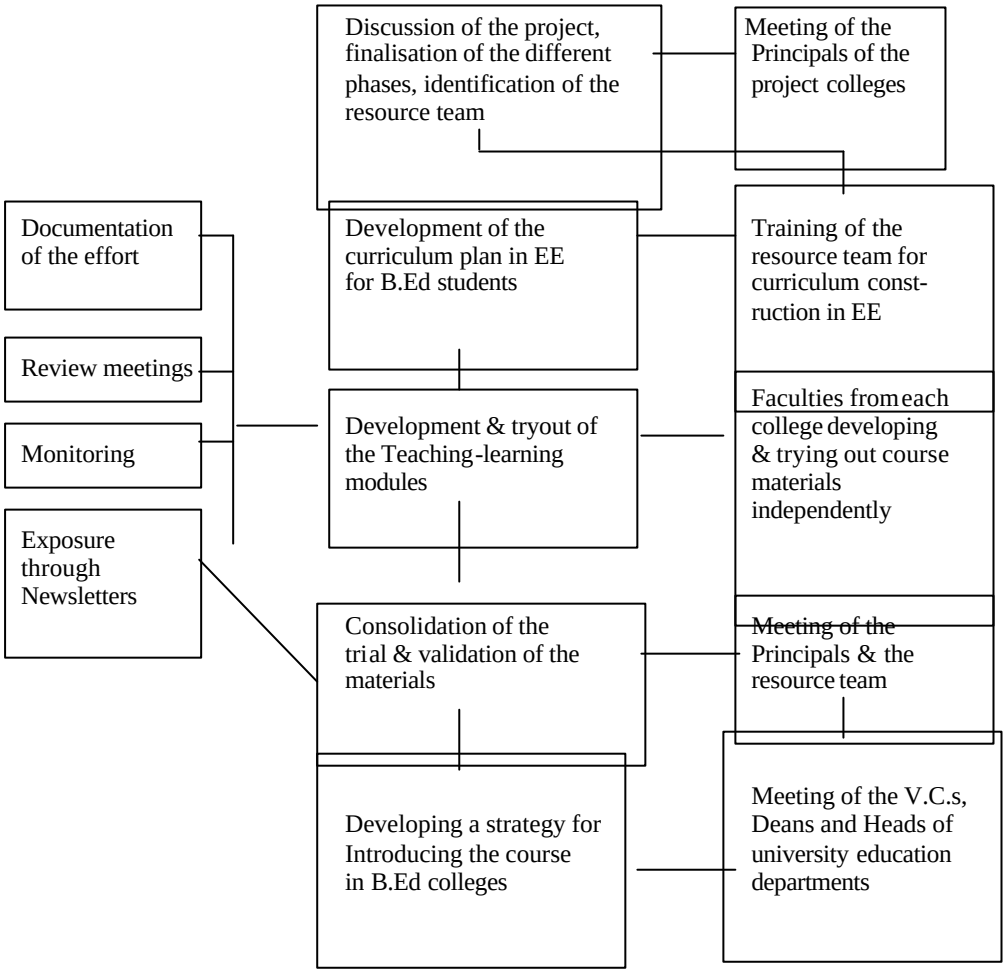
National Conservation Strategy and policy statement on environment and development, Ministry of Environment & Forests, Government o f India, 1992.

National Curriculum framework for school education, National Council for Educational Research and Training, New Delhi, 2000

Phillip Berke and Maria Manta (1999). Planning for sustainable development: Measuring progress in plans, Lincoln Institute of Land Policy.

Robottam I (1987). The dual challenge for professional development in environmental education, as quoted in the Report of the Learning for a Sustainable Environment, National Institute for Educational Research, Tokyo, Japan

Fig 1: Steps involved in evolving the EE curriculum



Appendix-1

ENVIRONMENTAL EDUCATION COURSE FOR B.ED STUDENTS

Course Contents

Unit-1: Our Environment

1.1 Concept, importance, components of our Environment,
1.2 Our Earth- ability to sustain life, Origin of life on Earth
1.3 Layers of Earth – lithosphere, hydrosphere, atmosphere and biosphere
1.4 Ecosystems – meaning, types, characteristics, ecological balance

Unit-2: Processes in Environment

2.1 Flow of energy through non-living components
2.2 Flow of energy through living components
2.3 Materials flow in ecosystems
2.4 Carrying capacity of the environment
2.5 Biomagnification

Unit-3: Resources, Problems and Management

3.1 Natural resources – renewable and non-renewable resources
3.2 Socio-economic-cultural factors leading to environmental degradation, changing life styles with respect to modernization and urbanization
3.3 Pollution – air, water, land, sound and radio active
3.4 Solving environmental problems – local and global – perspectives and initiatives
3.5 Conservation of natural resources – management of natural resources to meet the basic needs – reduce, refuse, reuse, and recycle
3.6 Population control
3.7 Eco-friendly life styles
3.8 Relevant legislative measures

Unit-4: Pedagogy in Environmental Education

4.1 Meaning, importance and scope of EE
4.2 Objectives and principles of EE
4.3 Approaches, methods and techniques of teaching EE
Approaches – Infusion and problem solving
Methods - Discussion, Demonstration and Project

Techniques - Observation, nature walk, nature game, role-play, brainstorming, survey, dramatization, puppetry, etc

4.4 Co-curricular activities in EE – field trips, collections, exhibitions, eco-clubs

4.5 Role of teachers, government and non-government organizations In promoting EE

Unit-5: Evaluation in Environmental Education

5.1 Nature of evaluation in EE

5.2 Use of appropriate tools and techniques of evaluation

Appendix-II

Description of the Modules

Formatted

The five modules developed as part of the project are intended to help the teacher educators (B.Ed faculties) in effectively transacting the contents of the EE course.

Each module begins with a brief introduction providing an overview of the topic, followed by specific objectives, content/concepts dealt with, description of the teaching methodology and evaluation items. Besides, the modules also include activities and case studies, text of the transparencies, additional information and list of books and videocassettes for further reference. The following gives a brief account of each module.

Our Environment: This module is intended to introduce the student teachers to a few basic concepts relevant to understanding and appreciating environment, its abiotic and biotic components and to create an awareness in them that Earth is the only planet where life exists and why it needs to be conserved.

Processes in Environment: This module deals with some of the fundamental processes in environment such as the flow of energy, interrelationship and interdependence, biogeochemical cycles, carrying capacity, etc. Besides, the module also attempts to reflect on how human beings have affected these natural systems through their actions and how care needs to be taken to save and conserve our environment.

Resources, Problems and Management: This module, while focusing some of the problems/issues of environment - related to natural resources, pollution, population, waste disposal, etc., brings forth the central role of all human beings in the protection, preservation and conservation of environment. Emphasizing the need for adopting environment friendly life style, the module highlights a few of the legislative measures, which India has formulated for environmental protection and conservation.

Pedagogy in Environmental Education: This module, besides dealing with such things as the meaning, importance, principles and approaches of environmental education, emphasizes the significance of using a variety of activity and student centered teaching - learning methodologies for promoting EE awareness. These include the use of both conventional and non-conventional teaching methods. Some of the methods dealt with elaborately are problem solving, discussion, brainstorming, survey, action research, etc. It also touches upon the role and functions of some of the important international and national organizations working for the cause of environmental protection.

Evaluation in Environmental Education: Provides an overview of the type of evaluation tools and techniques, which a teacher can employ to assess EE outcomes. These tools and techniques are illustrated by taking a few concepts from environmental education.

ABSTRACT

Curriculum Development and Institutionalization of a Course in Environmental Education for Pre-service Teachers – A Case study from India

By
Dr.M.J.Ravindranath

India is a country of vast diversity, both biological and cultural. It is one of the top twelve-mega diverse nations in the world and has a rich past, which had always shown respect and reverence to nature and environmental conservation. Despite all this, like many other countries in the world, India is also facing a major ecological crisis; a crisis resulting out of the degradation of environment through unscrupulous cutting of forests and trees, unprecedented rate of destruction and depletion of natural resources, increasing population and pollution, problems of soil erosion, etc.

India has well recognized that it is only through *Education*, a sub-system of the total societal system, that people could be made aware of and motivated to act for the protection and conservation of the environment. With this realization, a number of efforts have been made in the country to introduce Environmental Education at all levels of education and augment its potentialities with other sectors of development such as economic, social, political, legal, religious, technical, managerial, etc. However, still one notices a big gap at the teacher education, particularly at the pre-service level.

Recognizing the need and urgency of introducing Environmental Education (EE) in the Pre-service teacher education, this study was initiated during the year 1995 in Karnataka, a province in Southern India. The study involved:

1. Developing a curriculum framework (syllabus and methodology) in EE for pre-service teachers at the secondary school level, delineating the goal, objectives, content and methodologies of teaching and evaluation

2. Arriving at a set of course materials for teacher educators for transacting the course through the actual tryout of the developed materials in the B.Ed training colleges

3. Planning and organizing orientation workshops for teacher educators in institutionalizing the course in their respective training colleges

The course included five units, namely, 1) Our Environment, 2) Processes in Environment, 3) Resources, Problems and Management, 4) Pedagogy in Environmental

Education and 5) Evaluation in Environmental Education and reflected a local, national and international environmental perspective.

The developed course was tried out in more than 15 pre-service training institutions during 1996-1999 to assess its effectiveness, practicality and feasibility. The course has received tremendous response and appreciation from the student teachers, college faculties and administrators. It is highly encouraging to mention that the course has been made a part of the pre-service curriculum in many universities and is offered as an optional/elective paper. Through the project at least two faculties from each of the 64 teacher training colleges in Karnataka have been trained in the course.

The quintessence of the project lies in its methodology, which involved a process of Professional Development - Reflection, Analysis, Consolidation, Trialing and Evaluation on the part of the teacher educators. The student trainees of the colleges have taken up a number of action-oriented projects in the community, many of which have received appreciation from the local communities and government.

This paper enumerates the stepwise details of the scientific and systematic process adopted to evolve the curriculum and institutionalize it.

Dr.M.J.Ravindranath, Centre for Environment Education, Southern regional Cell, 143, Infantry Road, Bangalore- 560001, INDIA. Email: raviatri@hotmail.com
Fax: 91-80-2868209.

Return to Contents

32. Assessment and Policy Development of Sustainability in Higher Education with *AISHE*

Niko Roorda, MSc

Delft University of Technology & Brabant University of Vocational Education, The Netherlands

---

Biographic notes

From 1991, Niko Roorda, MSc, was a co-developer of a new study programme on Sustainable Technology. He was the head of this programme until 1998, when he started a project in the Brabant University of Vocational Education, called Project Cirrus, aiming at the implementation of sustainable development in more than 10 technical university programmes. This project, which has a pioneering and leading role in Dutch Higher Education, was granted the Dutch national award for Innovation and Sustainable Development in 2001.

From 2000 he has also worked on the development of the AISHE assessment tool. From 2002 he is working as a consultant for sustainability in Higher Education.

His e-mail address is: nroorda@planet.nl

Abstract

Following a request of the Dutch Committee on Sustainability in Higher Education (CDHO), an instrument has been developed, called *Auditing Instrument for Sustainability in Higher Education* (***AISHE***). Recently, the instrument has been completed. Practical tests have been done in a number of universities in the Netherlands and in Sweden.

AISHE can be applied as an instrument to assess the present situation in a (department of a) university, and as a tool enabling a representative delegation of the staff to envision a future situation in which sustainability has been integrated. In this way, an ***AISHE*** assessment can be used to strengthen the support for sustainability and to start or to improve a policy plan with respect to sustainability.

In the chapter, an overview is presented of the development project of the instrument, of the relations of it with quality management in general, and of the way to apply the instrument.

The second part of the chapter is a case study. One of the actual assessments will be described. Also, the effects of the assessment in the period after the assessment will be investigated.

Keywords

Accreditation, benchmarking, certification, criteria for sustainable higher education, external audit, internal assessment, quality management, visitation

1. The development of *AISHE*

1.1. The CDHO
The Dutch approach to the development of Sustainability in Higher Education (which from now, for short, will abbreviated to "SHE", for short) is a successful one.
As in many countries, there are a lot of initiatives in a number of universities. But that is not all: there is also a national committee, the "Committee on Sustainability in Higher Education" (CDHO). It started in 1998 as a rather informal collection of individual enthusiasts working in various universities, who sought a way to strengthen and help each other in their pioneering attempts to integrate sustainability in the educational programmes. In fact, it was students who took the initiative to form the CDHO.

Between 1998 and now, the CDHO has taken the lead in the development of SHE in the Netherlands. The committee is financed by the Dutch Government (the Ministry of Environment). Besides representatives of the major Dutch SHE projects, it consists of representatives of the Ministries of Environment, Education, Agriculture and Economical Affairs, and two rectors of universities.
The committee functions not only as a network organisation, but has also initiated a number of own activities. For instance, there is a national project called "disciplinary reviews sustainable development", which has produced a number of publications in which overviews are given of possible ways of implementing sustainability in individual university disciplines. Published so far are reviews on: *Management* (Jonker and Grollers, 2001); *Economics* (van den Bergh and Withagen, 2001); *Physics* (Bras-Klapwijk, 2001); *History* (van Zon, 2001); *Biology* (van Hengstum, 2001) and *Mathematics* (Alberts, 2001). Other disciplines will follow. Plans exist to have them translated in English, in co-operation with the Swedish MINT group (the Swedish equivalent of the CDHO).

Another action of the CDHO was the formation of a working group that had to develop a set of *criteria* for SHE. Soon, this working group decided that just the development of criteria was not enough: in order to operationalise these criteria, it was necessary to develop an assessment instrument. It is this instrument which would later be called ***AISHE***.
For this instrument, a number of basic decisions had to be made first.

1.2. Focus on education

Universities[16] can fulfil an important role with respect to sustainable development. In fact, they can do so in a number of ways, thus fulfilling several roles (see also: Clugston & Calder, 2000):

- The university as a research institute;
- The university as a centre of expertise for enterprises;
- The university as an organisation in itself;

[16] Wherever the term "University is used, it also refers to other institutions of Higher Education, e.g. the German Hochschule and the Dutch Hogeschool, unless explicitly stated differently

- The university as an institution for higher education;
- The university as a part of society in general.

As a research institute, a university is not really very different from other research institutes, for instance the ones linked to major industrial companies. Here, the university's contribution will probably exist of research in specific fields, e.g. environmental studies, sustainable economics, technology, sociology, agriculture, etcetera.

As a centre of expertise for enterprises, the university can assist companies, large ones as well as SME's, in projects related to sustainable development, either or not as commercial projects. The university can train the staff, it can accompany product development projects, or it can assist the company in developing sustainable elements in the company policy.

As an organisation in itself, the importance of a university is comparable to lots of other organisations. The major contribution in this respect lies in the environmental management and everything that is related to this. So-called "Greening the Campus" projects focus on these subjects. (See for instance Herremans & Allwright, 2000.)

As an institution of higher education, it is the task for the university to educate the students in such a way that afterwards, as professionals, they will think and act in a way that contributes to, or at least doesn't interfere with sustainable development. This can be realised in a lot of ways, for instance through special courses in sustainability subjects, or through integration of sustainability in the curricula of the courses.

Lastly, as a part of society, the university is an actor in all kinds of societal processes. It can participate in public discussions about the future through the media, it can assist primary or secondary schools in developing elements of sustainability in their education, or it can join in Local Agenda 21 projects, thus promoting the public awareness of the need for sustainable development. (See for instance Megerle & Megerle, 1999.)

Of these various roles, probably the education role is the most important one. This is because educating students in a sustainable way will have a snowball effect. If, for a number of years, a lot of students graduate from a university where they have acquired an attitude in which sustainable development is considered as important and where they have acquired knowledge and skills to express this attitude in their professional behaviour, the result will be that a flood of "ambassadors of sustainability" will function in a lot of companies.
In other words: If the university itself behaves in a sustainable way, it means that *one* organisation acts sustainable. If the university educates the students in a sustainable way, in time *many* organisations will act sustainable.

Of course, the different roles influence each other. Results of research in sustainable subjects and of commercial projects will have a spin-off towards education. Also, with an environmentally sound organisation management, the university will play a role model for the students. So, all different roles will contribute to the snowball effect.

This is why AISHE aims at the educational role in the first place. The other roles are not completely absent, because of their contributions to education; but the education is the focus of the assessment instrument.

1.3. Three other fundamental choices

In the discussions of the Working Group on Criteria for SHE, three separate dimensions appeared to be relevant, each leading to a fundamental decision about the nature of the criteria-to-be:

- *Content* oriented versus *process* oriented
- *Quantitative* versus *qualitative*
- *Prescriptive* versus *descriptive*

In more detail, this lead to the following considerations and decisions:

Dimension 1: Content oriented versus process oriented criteria

Content oriented criteria are about the concrete selection of subjects that should or should not be part of certain curricula, from a sustainable perspective, and about guidelines for the organisation management.

Process oriented criteria give information about the way in which the curricula are to be designed, and about the way in which decisions are made concerning the organisation management. These are criteria on a meta level.

Examples

Dimension 1	Content oriented	Process oriented
Curriculum	Photovoltaic cells are a part of the curriculum.	Decisions about sustainable subjects in the curriculum are made explicit.
Vision	The use of hen batteries is not compatible with sustainable development.	The organisation has a vision on ethical questions that are relevant for the own professional fields. This vision is updated regularly.
Staff development	Engineering teachers receive supplementary schooling in environment oriented product development.	There is a policy and a budget for staff development in sustainable development.

Considerations

The advantage of content oriented criteria is, they offer clarity: clarity about the product that is to be delivered (i.e. the educational content) and about the process (curriculum development, staff development).

At the same time, this clarity is a disadvantage, for various reasons:

- X They are absolute: they don't leave space for the own responsibility of an individual educational institute (or a part of it);
- X Fundamentally, they are not generally acceptable: they mirror the subjective opinion of the designer of the criterion, and so they carry the risk that others don't agree with them. If so, at best a never-ending yes-no-discussion could rise;
- X They are time related and statical: they have a risk of getting obsolete because of new developments. When for instance a new technical invention would be made which would make photovoltaic cells technically obsolete, at the same time the criterion would be obsolete.

Although process oriented criteria carry the risk of vagueness, this doesn't really have to be a serious disadvantage. For instance, the above mentioned criterion about a vision on ethics entails that educational organisations in which animal welfare is a relevant subject, will not be allowed to deny taking position about hen batteries.

Choice

Actually, the point about adopting process-oriented criteria is that, if the processes are formulated carefully and are executed carefully as well, it may be expected that the resulting contents will be ok too.
On the basis of this point, in the AISHE method the process-oriented principle has been chosen.

Dimension 2: Quantitative versus qualitative criteria

Criteria can either be formulated as quantitative measuring data, or in a less precise, more describing, qualitative way.
In the British "Higher Education 21" programme ("HE21") a large amount of quantitative indicators has been designed. Some examples are shown in the table below, in the column "quantitative".

Examples

Dimension 2	quantitative	qualitative
Curriculum	percentage of students participating in modules that are related to sustainability	The relation between sustainability aspects in the professional qualifications and the curriculum has been formulated explicitly
External effect	number of sustainability related conferences, organised in the current year	The organisation contributes actively to enlargement of knowledge and insight about sustainable development in society and to the public opinion

Internal environmental management	CO_2 emission per FTE[17] per annum	Annually an environmental report is published.

Considerations

Using quantitative criteria can only be meaningful, if the indicated quantities can be defined and measured in an exact way, and if there is an objective method to agree upon limits for them.

This is a problematic point of all above-mentioned quantitative examples.

- X The mentioned percentage of students, for example, can only be measured if it is possible to determine for each module if it is related to sustainability. But, how can this be determined? According to some people, nuclear energy is essential for a sustainable system of energy, while others combat this opinion; does a module on nuclear energy count for the above percentage?
- X How does one determine whether a certain conference is sustainability related? Is, let's say, a conference on waste processing sustainability related?
- X For which kinds of CO_2 emission will the educational institute be held accountable, and which will not? And, exactly how will the measurements be done to establish the numbers?

On top of all this, for all the above examples the decision of choosing a limit value is subjective and normative, and so each measured quantity will always be questionable.

In other words, the disadvantage of quantitative criteria is that they suggest a fictitious level of exactness that in reality cannot be made true.

The "right" percentage of credits

A characteristic example of this fictitious exactness is the (in some places) ongoing discussion about the "right" percentage of the curriculum that should be dedicated to sustainable development (expressed in a percentage of the credit points). According to some this should be 5%; others claim the optimal value should be higher or lower. In fact every concrete percentage is fundamentally wrong. In the first place because of the fictitiousness of the exactness: does a module handling, say, environmental law, fall within this percentage of sustainable curriculum parts? And what about the earlier mentioned module on nuclear energy?

In the second place, quite a few modules have nothing or hardly anything to do with sustainability when viewed on their own, but are very relevant for sustainability when viewed in a larger framework. A characteristic example is a module in a mechanical engineering programme dealing with connection technologies (gluing, screwing, welding, clamping, etc.): on their own, these techniques are not clearly more or less sustainable. But when a product consisting of several components is to be designed, subjects will appear like *design for disassembly* and *reuse and recycling*, which are very relevant for sustainability; and a thorough knowledge of connection technologies contributes to a good designing process. Such a module doesn't belong in a direct sense to the percentage of sustainable curriculum parts, but it certainly does in an indirect way.

Choice

Many aspects of the level to which sustainability has been integrated in education and in the organisation have fundamentally no exact nature. This does *not* imply that they

[17] FTE = Full Time Equivalent, full time employment position

cannot be measured; but usually they have to be expressed on an ordinal scale, instead of a quantitative interval scale.
Therefore, with respect to the ***AISHE*** method a qualitative approach has been adopted, and the results are expressed on ordinal scales.

Dimension 3: Prescriptive versus descriptive criteria

Criteria can be designed as obligatory prescriptions, as is usual with many of the customary instruments for quality and environmental management. In the table below, in the left column a number of examples are shown, derived from ISO 14001, EMAS and BS7750.
The alternative is a descriptive character. This may take the form of an ascending progression of descriptions, together constituting an ordinal scale; an organisation can compare itself with this scale and determine which organisation development stage it is in.
A good example of this is the EFQM method: for a series of criteria five "stages" are discerned. The table below shows some examples in the right column (see: HBO Expert Group, 1999).

Examples

Dimension 3	prescriptive	descriptive
Staff Development	The organisation shall (…) require that all personnel whose work may create a significant impact upon the environment, have received appropriate training. *(ISO 14001: 4.4.2)*	***Stage 1:*** Staff counselling, training and development are dependent on individual initiatives. *(EFQM-HE: 3.5)*
Policy	The company environmental policy shall be adopted and periodically reviewed. *(EMAS: appendix 1, A.2)*	***stage 3:*** The policy is evaluated on the basis of a systematic analysis (...). *(EFQM-HE: 2.4)*
Communication	The organisation shall establish and maintain procedures for receiving (…) communications (internal and external) from relevant interested parties. *(BS7750: 4.4.1)*	***stage 4:*** Interested parties are actively involved in discussions about policy development and implementation. *(EFQM-HE: 2.3)*

Considerations

The use of prescriptive criteria has several disadvantages.
A main problem is that the prescription of criteria is *normative*. True enough, the actual designing of sustainable education is fundamentally normative, because the goals and the

contents are strongly related with the personal views of those who are responsible for the study programmes, and depend on their ethical norms. But exactly because of this, it is impossible to construct a measuring instrument based on normative prescriptions and then receive a general acceptation.
Besides, imposing external obligatory criteria would contradict one of the most important cornerstones of sustainable development: the own individual responsibility of each person and institution involved in the process of sustainable development.

Another point: Only a few universities have appeared to be able to meet high standards: for instance, in Europe there aren't many universities possessing an ISO certificate. This is a serious disadvantage of obligatory prescriptions: if they can hardly be met, they don't stimulate to try to reach them. And the only alternative - lowering the limit - doesn't sound attractive because this means compromising on beforehand.

A final argument is that it isn't always evident that an educational organisation will have to strive for the highest quality demands in all respects: the maximum isn't always the optimum. An organisation may decide deliberately to aim at lower stages for certain aspects, on the basis of internal or external reasons. If a measuring instrument would be based on on-off prescriptions, an organisation doing so would automatically disqualify itself.

Choice

Criteria for sustainable education should place the responsibility for choosing goals and limits with those take care of designing and implementing education, i.e. with individual organisations (universities or parts of universities).
Besides, criteria should be practically applicable and contribute to the organisation policy.
For these reasons, AISHE is decided to consist of descriptive criteria, enabling the formulation of auditing results in more than two possible values.

1.4. The assessment instrument

Criteria should be practically applicable, and so the Working Group decided to develop an assessment instrument based on the list of criteria.
The logical next question was: for *whom* should this instrument be developed? Why would a SHE assessment instrument be interesting, and for which parties?
There are two kinds of stakeholders, it was concluded. In the first place there are the **universities** themselves, which could use such an instrument for several reasons:

- To assess the present situation within the university or within a part of it (e.g. a faculty or a separate study programme) with respect to SHE
- To design elements of a desired future situation, perhaps even leading to a structured policy plan regarding SHE
- To get staff members and managers involved in a process of developing SHE, and to join forces within the organisation
- And later: to have repeated assessments, in order to be able to evaluate the SHE policy of a former period.

In the second place, a whole range of external institutions and people could benefit from a SHE assessment tool. For instance:

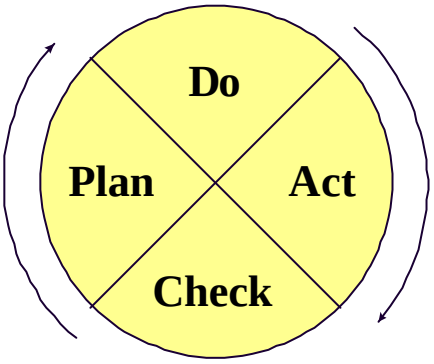
- For external audits, related to a larger (for instance national) quality management programme, related to visitations and/or accreditation
- For decisions by external sponsors about financing projects etc.
- For potential students, to help them select the best university.

This lead to a number of restrictions about the instrument that was to be developed.

1. Since it was to be *process oriented*, it should be about the quality of these processes. So, there had to be a direct relation with the general quality management.
2. It should enable internal assessments as well as external audits.
3. It should be able to apply it in the process of visitations and accreditation.
4. Since it should enable potential students to select their university, it should be applicable for *benchmarking* and *ranking*.
5. In order to raise the involvement of the staff and the management, it should get quite a lot of those people involved in the assessment process.
6. Because of the qualitative character, it should make use of *ordinal* scales instead of e.g. ratio scales.
7. And since it should be descriptive and not prescriptive, it should offer the assessors a range of possible descriptions with which the own organisation could be compared.

Because of the desired relation with the general quality management, it was a natural step to look at existing instruments for quality management, and to see if it was possible to adopt such an instrument and adapt it for SHE.
We were able to find such an instrument, which met all our needs remarkably well.

The European Foundation for Quality Management had developed a model for quality management, named EFQM after this organisation. As a basis, they took the Quality Circle of Deming: to the parts "Plan", "Do" and "Check" were attached a number of criteria concerning the quality management in a company.



The Dutch organisation for quality management, INK, enhanced the EFQM model by attaching to each of the EFQM criteria an ordinal scale of five stages. Each stage is a verbal description of a possible state the assessed company is in, with respect to this criterion. (See: INK, 2000.)
Starting with this EFQM-INK-model, a group of Dutch universities for Vocational Education ("Hogescholen") made an adapted version for Higher Education (which may be called the EFQM-HE-model, see: HBO Expert Group, 1999).
It is this EFQM-HE-model which has been taken as the basis for AISHE.

1.5. *AISHE* : stages and criteria

A general description of the five stages which together form an ordinal scale, is shown in the table below:

General description of the 5 stages				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Educational goals are subject oriented. - The processes are based on actions of individual members of the staff. Decisions are usually made ad hoc.	- Educational goals are related to the educational process as a whole. - Decisions are made by groups of professionals.	- The goals are student oriented instead of teacher oriented. - There is an organisation policy related to (middle)long-term goals. - Goals are formulated explicitly, are measured and evaluated. There is feedback from the results.	- The educational process is seen as part of a chain. - There is a network of contacts with secondary education and with the companies in which the graduates will find their jobs. - The curriculum is based on formulated qualifications of professionals.	- There is a long-term strategy. The policy is aiming at constant improvement. - Contacts are maintained, not only with direct customers but also with other stakeholders. - The organisation fulfils a prominent role in society.

Although the general description of these stages in *AISHE* matches those of the EFQM-HE-model, the criteria themselves certainly do not. They are the ones that are used as a description of what sustainability in higher education is all about.
The list is shown below:

AISHE : The criteria list	
== Plan ==	**1. Vision and policy** 1.1. Vision 1.2. Policy 1.3. Communication 1.4. Internal environmental management **2. Expertise** 2.1. Network 2.2. Expert group 2.3. Staff development plan 2.4. Research and external services

== Do ==	**3. Educational goals and methodology** 3.1. Profile of the graduate 3.2. Educational methodology 3.3. Role of the teacher 3.4. Student examination **4. Education contents** 4.1. Curriculum 4.2. Integrated Problem Handling 4.3. Traineeships, graduation 4.4. Speciality
== Check ==	**5. Result assessment** 5.1. Staff 5.2. Students 5.3. Professional field 5.4. Society

As an illustration of all this, criterion 2.3 (staff development plan) is shown in detail, with all five stage descriptions:

Criterion 2.3:	**Staff development plan**			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Staff development in sustainability depends on individual initiatives.	- There is a staff development plan in sustainability. - **This plan is mainly short term related.** - For the execution of the plan, facilities are made available by the management.	- The need of the organisation for expertise in sustainability is known. - The development plan is based on a match between this need and the individual wishes of the staff members for supplementary training and refresher courses. - The plan is mainly middle long-term related.	- The sustainability staff development plan is long term related. - It includes a policy towards appointments and resignations, retraining, introduction of new staff members. - An explicit relation exists with the strategic policy of the organisation in general.	- The organisation policy on sustainability is based on societal and technological developments. - There is a systematic feedback to society.

During 2000 and 2001, the list of criteria was designed and discussed with a lot of stakeholders from within and outside of education. (The details of this development have been published, for instance in Roorda, 2000), and for each of the criteria the five stages were designed.
In the second half of 2001, the development was completed with a series of practical tests in universities in Sweden and the Netherlands. The procedure of these tests, as well as the detailed results of one of these, will be described in the next part.

2. A case: Hogeschool Himbreeg

2.1. The assessment procedure

In short, the procedure for an assessment is as follows (if a minimum scenario is followed):

Some of these steps will be explained in some more detail.

Group of participants

In small organisations (up to about 15 staff members) each staff member can participate.

The steps of an* AISHE *assessment (minimum approach)

- Preparation with the internal assessment leader:
  - Explanation of the method
  - Discussion of the procedure
  - Selection of criteria and appendices to be treated
  - Composition of the group of participants
- Written information to the participants
- Introduction with the group of participants:
  - Explanation of the ***AISHE*** method
  - Discussion of the procedure
- Filling in the criteria list: by the participants individually
- Consensus meeting, participants + consultant
- Review with internal assessment leader

In larger organisations a group of 10 to 15 participants is selected. The group has to be representative for the complete teams of the staff members and the students, so there have to be one or more managers, a number of teachers (professors, lecturers, etc.) coming from a wide variety of disciplines and curriculum parts, some students, and perhaps one or more members of the non-teaching staff.

Filling in the criteria list (individually)

After the model has been explained to all participants, they are asked to read the part of the *AISHE* book that contains the descriptions of the five stages for all criteria. While doing this, individually, they compare this to their own organisation (e.g. an education programme or a faculty of their university), and find the stage which resembles their own situation most.
At the end, they write their conclusions down on a form and hand it to the assessment leader, who combines the conclusions of all on one composite form.

Consensus meeting
Next, a meeting takes place in which all of the participants are present. At the beginning (or earlier) the copied composite form is distributed.
As before, every participant has the ***AISHE*** book, in which the own scores and annotations are written: these are essential for the meeting.
All participants have an equal weight in the discussions, in the proceeding of the conversation and in the decision making.
Each (selected) criterion is discussed. On a basis of intrinsic reasoning, a common conclusion is looked for about the right score of the organisation.
If possible, decisions are made based on consensus. If, however, for some criterion no consensus can be reached, the chair will conclude that, of all proposed scores, the *lowest* is the one that is decided upon: this is, because a (higher) score has only definitively been realised if all participants agree with it.
In *no* case at all, decisions are made by voting.

Desired situation, priorities, policy
During the discussion of the criteria, naturally a number of possible improvement points will rise. This will enable the group to formulate – for each criterion – a *desired* situation. This desired situation is defined, not only in the form of a stage to be reached, but also in the form of a series of concrete targets and associated activities that will lead to the desired stage.
In order to guarantee that the necessary concreteness is really achieved, at the beginning of the consensus meeting a decision is made about the (future) policy period the desired situation is related to. This may for instance be a period of one year, starting at the moment of the assessment.

When for all 20 criteria, or for a major part of them, policy intentions are defined in this way, a large list of goals and activities will be formed on which work can be done in the coming period. But then of course the danger is that if this list is rather huge, in reality probably many of them will not have much of a chance: it's a well-known fact that a policy plan with more than 3 to 5 priorities usually has not much chance of success.
This is why the meeting ends with the assignation of those elements in the list of policy ideas that the group judges are most important: those elements receive highest priority.

The result
- A description of the *present* situation, in the form of a number (the stage) for each criterion plus a description for each criterion in words;
- A ditto description of the *desired* situation;

- A *date* on which this desired situation has to be reached;
- A list of first priorities, that are considered to be crucial in order to be permitted to conclude that the policy will have been successful.

In the end, this package has the status of "recommendations to the management".
This set of recommendations has a good chance of being accepted by the management and to become a part of a concrete policy plan. This is because the management itself is represented in the group of participants (and that is exactly why that is so vital!); and the recommendations have – if all went well – been chosen in consensus by a representative group from the staff and the students, so it is likely that there is support for the conclusions.

For an assessment in which all 20 criteria are investigated, the consensus meeting(s) will probably take 4 to 6 hours.

2.2. The results of the Hogeschool Himbreeg

One of the universities where the assessment has been done, in order to test the instrument, was the Hogeschool Himbreeg (Netherlands; in fact the name "Himbreeg" is fictitious, in order to anonymise the results), a university for professional education. Tested was the study programme "Food Science and Technology". (In fact, the assessment was done twice, see later.)

The results of the assessment are:

---

*=== **PLAN** ===*

1. Vision and policy

Criterion 1.1. Vision
Present situation: Stage 1
The Protocol on Sustainable Education has been signed for the university as a whole. There are good intentions, but there is no thoroughly developed vision.
Desired situation: Stage 2 - ***High Priority***
Explicit vision, put down in documents.

Criterion 1.2. Policy
Present situation: Stage 1
There is a start.
Desired situation: Stage 2 - ***High Priority***
Not wanting to run too fast, so no translation in measurable goals.

Criterion 1.3. Communication
Present situation: Stage 1
Probably, not everybody knows that the Protocol has been signed: perhaps about 30% of the university staff have the information. In our own department, this percentage may be higher.
Individually, staff members have contacts with each other on sustainability. Unofficial discussions.
Desired situation: Stage 3 - ***High Priority***
The Protocol is better known.
The ***AISHE*** assessment contributes to the discussions. Concrete targets are to be made about the integration of sustainability in education: formulate a sustainability project, as an item for the project manager of curriculum development.

Criterion 1.4. Internal environmental management

Present situation: Stage 1

The laws and regulations on chemical waste are implemented. Waste is separated. The catering uses "environment cups".

Desired situation: Stage 2

An environmental coordinator is absolutely necessary, as well as a policy plan on operations and environment. Not on the level of this department but on the level of the whole university.

2. Expertise

Criterion 2.1. Network

Present situation: Stage 1

There are working relations with P., A. and E. This is on the level of individual staff members.

Desired situation: Stage 2

Involve the Professional Field Committee, enlarge it if necessary. Link it's work to the policy on traineeships. Report about it regularly in meetings and in the processes of curriculum development.

Criterion 2.2. Expert group

Present situation: Stage 1

Some staff members involve some aspects of sustainability in curriculum development. E.g. in the subject on ethics.

Desired situation: Stage 2

In order to realize an expertise center on sustainability, a lot of time will have to be made available. A development plan will be made in order to acquire the necessary expertise.

Criterion 2.3. Staff development plan

Present situation: Stage 1

A small number of staff members have a fair or even a thorough knowledge on sustainability. Most people don't know this of each other.

On the subject of chain management, last year a project has been done on the enlargement of the knowledge of the staff. This is sort of a policy, but up till now only incidentally.

Desired situation: Stage 3 - ***High Priority***

A systematic approach will be developed on staff education with respect to sustainability, based on the integral vision on sustainability that will be developed (see 1.1).

All staff members know quite exactly which knowledge is present with their colleagues. All have good knowledge and insight within their own field of work. This is true for all specialties of the study program.

Criterion 2.4. Research and external services

Present situation: Stage 0

There are no commercial projects in which sustainability is an element.

Desired situation: Stage 0

There are no plans to change this situation.

==========

=== *DO* ===

3. Education goals

Criterion 3.1. Profile of the graduate

Present situation: Stage 1

The educational goals contain some environmental issues, like "Handle with care..."

Desired situation: Stage 2

The present educational goals will be investigated in correspondence with curriculum development, and improved wherever possible with respect to sustainability.

Criterion 3.2. Educational methodology

Present situation: Stage 2

The new curriculum has been designed in such a way that individual responsibility is trained (stage 3): e.g. propaedeutical projects. In practice this has not yet been realized in all parts. Students are members of the Education Committee.

Desired situation: Stage 4 - ***High Priority***

Make visible, in what way the own choices and decisions of the students are related to the professional practices. Differences in graduation profiles and in the starting profiles of individual students are to be made clear. The way to do this: portfolios, coaching of individual students. Plus: solve practical problems, e.g. timetables in relation with individual learning routes.

Criterion 3.3. Role of the teacher

Present situation: Stage 1

Some individual teachers give attention to this. The organization doesn't propagate it st rongly.

Desired situation: Stage 1

The organization will advocate sustainable behavior of the staff. Wherever possible, all teachers will do the same. Feedback will be given, e.g. by making sustainability an item on the agenda of staff appraisals. Al least four times a year, sustainable behavior will be an item in the discussion groups.

Criterion 3.4. Student examination

Present situation: Stage 1

Within a few months the student activities in the "thematic weeks on sustainability" will be assessed. The same is true for the global LCA.

Desired situation: Stage 2

While formulating the educational goals with respect to sustainability, a systematic assessment of the student achievements will be developed in relation with it.

4. Education contents

Criterion 4.1. Curriculum

Present situation: Stage 2

The first year contains a module of 80 hours (2 credit points) on basic knowledge on sustainability (the "thematic weeks on sustainability"), which are obligatory for all students.
The second year contains an 80 hours (3 ects-credits) module. Elements are present like: environmental law, global LCA's, environmental management systems as a part of quality management.
In one of the graduation profiles, chain management is treated.

Desired situation: Stage 3

The results of the module are intertwined with the rest of the curriculum.
For the rest of the curriculum, investigation is necessary and will be done.

Criterion 4.2. Integrated Problem Handling

Present situation: Stage 2

Propaedeutical projects and 2nd year projects are done, 1 theme per period, each with an integrating approach.

Desired situation: Stage 3

First improve what we have, before starting new things.

Criterion 4.3. Traineeships, graduation

Present situation: Stage 1

Some traineeships contain elements of sustainability, e.g. environmental management systems. Not many chain related subjects.

Desired situation: Stage 2

Sustainability will be inserted in an existing checklist of obligatory points of attention for trainees hips and graduation projects.

Criterion 4.4. Speciality

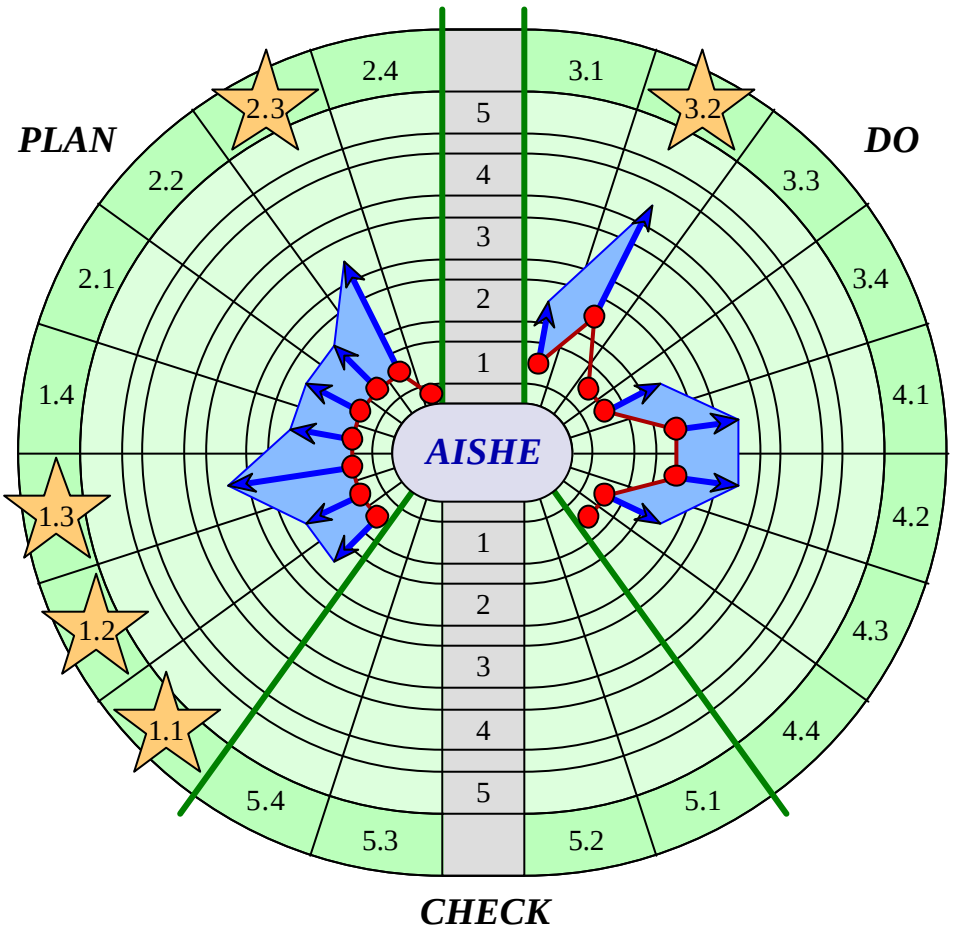
Present situation: Stage 1

The possibility of choosing a minor sustainability specialism exists.

Desired situation: Stage 1

There is no wish to enlarge the possibilities in this way.

(The third part, "Result assessment", was not investigated.)



These results can be presented in a graphical way, like this:

2.3. Global indicators

On the basis of the results of the assessment, some indicators can be calculated which give a global view of the situation. They are:

Median:

One could be tempted to calculate the *mean* stage, in order to get an indication about the situation in general. Unfortunately this is not allowed: the stages belong to ordinal scales, and so they can't be averaged.
Instead, the *median* can be used. This is to be found as the middle value of all scored stages, after they have been put in an ascending order.

PLAN DO Balance:
The *Plan Do* balance is the difference between the sum of the *DO*-scores and the sum of the *PLAN*-scores.
If this balance is less than zero, relatively much attention is given to the preparation ("*PLAN*"), which is not yet implemented in education in an equal proportion ("*DO*").
If the balance is greater than zero, the education has been made sustainable in a relatively strong amount, but this is not very well anchored in the organisation.
This indicator should be used with great care! Here too it is true: the stages form ordinal scales, and so it is not allowed to add or subtract them. Because of this, the result can only be interpreted as a very rough and global indicator. A difference between a Plan Do balance of e.g. 2.5 and one of 3 cannot be interpreted as significant.[18]

Policy ambition : The results for these global indicators for the Hogeschool Himbreeg will be shown in the next part.

= the sum of all differences between the desired and the present stages.
The same cautiousness goes for this indicator: a difference between an ambition of e.g. 6 and one of 7 is not significant. But since practical tests have shown that there exist remarkable differences (policy ambitions varying between 6 and 24), the policy ambition is nevertheless an interesting quantity.

Distance to protocol:
= the total number of stage steps to take, necessary to meet the demands of a certain protocol.
At the moment of publication of this book the only protocols that exist are the ones belonging to the Certificate for Sustainable Higher Education, designed for the Dutch Higher Vocational Education.

2.4. Reliability of *AISHE* : Equivalence between groups

The *AISHE* developing group was lucky to have the opportunity to do the assessment twice in the same situation. The Hogeschool Himbreeg kindly offered two groups of participants to do the assessment with. Theoretically, the two groups were 100% equal, each consisting of the same amount of managers, teachers and students of the same study programme.

[18] Objections from a theoretical standpoint can be made against such an indicator. But, if used in a cautious way, it is possible to draw some conclusions from it. Some strong precedents exist. The Eco-indicator, for instance, is in the same way an aggregate quantity, in which variables of an incomparable magnitude are added together through the use of weight factors. One could say: in the Plan Do balance, to all AISHE criteria a weight factor of 1 is given.

This enabled the investigators to test the equivalence between groups, an important aspect of the reliability of the method.

The results, when compared, are remarkably equivalent:

University Department		Himbreeg - Food Science & Techn. - Group 1			Himbreeg – Food Science & techn. - Group 2			Difference (group 2 - group 1)		
Criterion	**No.**	**Present situation**	**Desired situation**	**Priority**	**Present situation**	**Desired situation**	**Priority**	**Present situation**	**Desired situation**	**Priority**
Vision	1.1.	1	2	1	1	3	1		1	0
Policy	1.2.	1	2	1	1	3	1		1	0
Communication	1.3.	1	3	1	1	2	1		-1	0
Internal environmental managem.	1.4.	1	2		1.5	3		0.5	1	
Network	2.1.	1	2		1	2				
Expert group	2.2.	1	2		1	2				
Staff development plan	2.3.	1	3	1	1	2.5			-0.5	-1
Research and external services	2.4.	0	0		0	1			1	
Profile of the graduate	3.1.	1	2		1.5	3		0.5	1	
Educational methodology	3.2.	2	4	1	2	3			-1	-1
Role of the teacher	3.3.	1	1		1	2			1	
Student examination	3.4.	1	2		1	1			-1	
Curriculum	4.1.	1.5	2.5		1.5	2.5				
Integrated Problem Handling	4.2.	2	3		3	3		1		
Traineeships, graduation	4.3.	1	2		1	2				
Speciality	4.4.	1	1		1	1				
Global indicators:										
Median	**Med**	1	2		1	2.25			0.25	
Plan Do balance	*PDB*	3.5	1.5		4.5	-1		1	-2.5	
Policy ambition	*PoA*		16			16.5			0.5	
Distance to Protocol 2000	*D00*	3	0		2	0		-1		
Distance to Protocol 2002	*D02*	7	0.5		6	0		-1	-0.5	

Formatted

This proves that *AISHE* rendered (at least in this case) a very reliable result. Most of the "present" scores are identical: only 3 out of 16 scores differ. The "desired" scores show more difference, but that is no surprise, since this is not a measurement but the result of a group discussion about possible future developments. Nevertheless, the total policy ambition in both groups is almost equal (16 vs. 16.5). Perhaps this v alue in some way reflects the organisation culture.

The resemblance between the two group results is all the more remarkable, because there appeared to be a noticeable difference in the atmosphere during the consensus meeting: members of one group were rather "pro" sustainability, while some of the members of the other group showed some more scepticism.

Also, most of the priorities are the same in both groups. It is interesting that most of them are in the "Plan" part. This is related – as both groups explained – to the fact that the Plan-Do-Balance is not in equilibrium. According to both groups, the "Plan" part is low, compared with the "Do" part, indicating that the management and the staff of the study programme are doing quite well in the education itself, but is underestimating the importance of anchoring the sustainability achievements in the vision and the policy.

In order to appreciate these values better, it is interesting to compare them with those of other universities.

2.5. Comparison with other universities

So, where does the Food Science & Technology Program of the Hogeschool Himbreeg stand, when compared to other universities?

The table below, containing the results of some Swedish and Dutch universities, shows it. It appears that Himbreeg, though not the best of the investigated universities, is doing no less than the others.

	Himbreeg – FST group 1			University 2			University 3			University 4		
No.	**Present situation**	**Desired situation**	**Priority**	**Present situation**	**Desired situation**	**Priority**	**Present situation**	**Desired situation**	**Priority**	**Present situation**	**Desired situation**	**Priority**
1.1.	1	2	1	2	3	1	2,5	3		3	4	
1.2.	1	2	1	2	3	1	2,5	3		3	4	
1.3.	1	3	1	1	2	1	1,5	2	1	2	3	
1.4.	1	2		1	2		2,5	2,5		4	5	
2.1.	1	2		1	2		2	3	1	2	4	1
2.2.	1	2		2	3		2	3	1	2,5	4	1
2.3.	1	3	1	1	3		2	3	1	4	4	
2.4.	0	0		2	2		2,5	4	1	2	2,5	
3.1.	1	2		0	1		3	3		1,5	3	
3.2.	2	4	1	2	3		4	4		2	3	
3.3.	1	1		1	2		1	1		2	4	
3.4.	1	2		1	2		3	3		1,5	2,5	
4.1.	1,5	2,5		1	2	1	3	3		1,5	3	
4.2.	2	3		2,5	3		3	3		2	2,5	
4.3.	1	2		1	2		3	3,5		1	2	
4.4.	1	1		1	1		4	4		1	1	
Med	1	2		1	2		2,5	3		2	3,25	
PDB	3,5	1,5		-2,5	-4		6,5	1		-10	-9,5	
PoA		16			14,5			6,5			24	
D00	3	0		4	0,5		0	0		0	0	
D02	7	0,5		6,5	1,5		0,5	0		1	0	

Formatted

As the table shows, the policy ambition of the Hogeschool Himbreeg is somewhere in the middle, compared with the others: university 3 scores significantly lower, while university 4 (which already scores very high) is very ambitious.

2.6. Appreciation and effects of the assessment results

On certain pre-determined moments during and after the assessment, the participants were asked to fill in some brief questionnaires about their appreciation of the assessment. From the answers, it appears that the participants are enthusiastic about the way sustainability is approached with *AISHE*. They think *AISHE* is a valid investigation tool: the results represent the actual situation with respect to sustainable higher education well. Also, the application of *AISHE* made it clear where the strong and the weak points of SHE in the university are, regarding the attempts to implement sustainability in education and in the organisation policy. A good illustration of this is the fact that most of the participants did not know that the university as a whole had already signed the Charter for Sustainable Vocational Higher Education (a Dutch charter comparable to the Copernicus Charter). "Communication" (criterion 1.3) was one of the items that got a high priority. (By the way, this seems to be a regular thing: the same is true for 2 of the other 3 universities.)

The management of the study programme agrees with the opinions of the teachers. They too are enthusiastic about the *AISHE* assessment. The results form a solid starting point for the improvement and structuring of the policy development for sustainability in their university faculty – which they consider as very important, since the subject of their study programme (the food sector) is evidently dependent on a sustainable future. Unfortunately, at the time this article is written, the policy plan has not yet been finished, so it is impossible to show some clear sustainability contents of it. But the management made it clear that a part of the budget certainly will be dedicated to implement the recommendations that resulted from the assessment.
The relevance – according to staff and management of the Himbreeg Food Science & Technology department – of *AISHE* is reflected in the fact that, shortly after the assessment, a "general" EFQM-HE assessment was done by the same department.

2.7. Future developments
With several of the assessed universities, it is agreed that in one or in one-and-a-half year the assessment will be repeated; perhaps even in all of them. This will enable the project team to investigate, which part of the plans resulting from *AISHE* will appear to be successful.

Consultancy
In the mean time, the number of assessments will grow. Now that the *AISHE* instrument has been tested, evaluated and completed, a follow-up project has started (again financed by the Dutch Ministry of Environment). During this second project, the *AISHE* team will be able to work as consultants, assisting universities that are working on the implementation of sustainability in their education.
Of course, *AISHE* will be used as a tool for this consultancy. But besides, other options are available, before or after an *AISHE* assessment, as the box shows:

Elements of a more intensive consultancy (optional)

Before:

- Introduction of sustainable development with the staff, e.g. through presentations or workshops, as a preparation for an ***AISHE*** assessment
- Introduction of sustainable higher education with the management, e.g. through presentations or discussions, as a preparation for an ***AISHE*** assessment

After:

- Assistance with the translation of the results to policy- and activity plans
- Assistance with the application of the results in relation to the (Dutch) Certificate for Sustainable Higher Vocational Education or in relation tot the Copernicus Charter
- Assistance with the integration of ***AISHE*** and SHE in the internal quality management

Training of sustainability coordinators

A second objective of the second *AISHE* project is the training of staff members of universities (e.g. quality- or sustainability co-ordinators) with respect to sustainability in higher education. Here, too, *AISHE* will be a tool within the training programme.

References

Alberts, G. (2001): Wiskunde *en Duurzame Ontwikkeling*. Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands

Van den Bergh, J. en Withagen, C. (2001): *Economie en Duurzame Ontwikkeling*. Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands

Bras-Klapwijk, M. (2001): *Natuurkunde en Duurzame Ontwikkeling*. Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands

BS 7750 – Environmental management Systems (1992). British Standards Institute

Clugston, R.M. and Calder, W. (2000): *Critical Dimensions of Sustainability in Higher Education*. In: Leal Filho (2000c)

EFQM Model (1991). European Foundation for Quality Management. http://www.efqm.org

EMAS – Environmental Management Systems (1993). European Commission, Council Regulation 1836/93

HBO Expert Group (1999): Method for improving the quality of higher education based on the EFQM model. *3rd version, Hanzehogeschool (representative), Groningen, Netherlands. Translation of: Expertgroep HBO (1999)*

Van Hengstum, G. (2001): *Biologie en Duurzame Ontwikkeling*. Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands

Herremans, I. and Allwright, P.S. (2000): *Environmental management systems at North American universities: what drives good performance?* International Journal of Sustainability in Higher Education Vol. 1 No. 2.

INK (2000): *Gids voor toepassing van het INK-managementmodel*. INK, 's Hertogenbosch, Netherlands

ISO 9000 and 14000 series: International Organisation for Standardisation (ISO) http://www.iso.ch

Jonker, J. en Grollers, R. (2001): Duurzame ontwikkeling in de Bedrijfskunde. *Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands*

Leal Filho, W. (ed.) (2000c): *Sustainability and University Life*. Peter Lang, Frankfurt

Megerle, A. and Megerle, H. (2000): University support to local and regional agenda initiatives for sustainable development. *In: Leal Filho (2000c)*

Roorda, N. (2000): *Auditing Sustainability in Engineering Education with **AISHE***. Entree 2000 Proceedings, Belfast UK. EEE Network, Brussels.

Van Zon, H. (2001): *Geschiedenis en Duurzame Ontwikkeling*. Netwerk Duurzaam Hoger Onderwijs en UCM/Katholieke Universiteit Nijmegen, Netherlands

Websites

- Committee for Sustainable Higher Education (CDHO): Secretariat through University of Amsterdam, tel. +31 (0)20 5256266, www.dho21.nl
- European Foundation for Quality Management (EFQM), www.efqm.org
- INK (formerly: Instituut Nederlandse Kwaliteit), www.ink.nl

Return to Contents

33. Developing curriculum for teacher education toward sustainability

I.Salite, A.Salitis, R.Klepere

Daugavpils University, Latvia

Abstract

Paper discusses the results of case study obtained within an action research commenced at Daugavpils University. Case study under the consideration is accomplished through university study course "Environmental education" and is compared with the results obtained in the study course "The integrated nature science". Action research was applied to help students evaluate their attitude toward sustainable education and construct their interpretation of features related to sustainable education. Students' interpretations were submitted to the qualitative analysis. Selective coding/decoding resulted in an extraction of "sustainable education" as a basic category and discovery of several subcategories such as "sustainable education based on anthropocentrism", "sustainable education based on the joining of anthropocentrism and ecocentrism" and "sustainable education based on ecocentrism". Typical opinions and their specific features have been distinguished in each of subcategories.

Research data can be offered to the respondents for re-evaluation and applied as a tool for the discussions about the aim of sustainable education and principles of content selection within a discipline of environmental education.

The article contains methodological considerations for the selection of case, peculiarities of the research method, as well as results and conclusions obtained within the case study.

Key words: sustainable education, sustainable education on the basis of anthropocentrism, sustainable education on the basis of anthropocentrism/ecocentrism, sustainable development on the basis of ecocentrism

Introduction

Since the Bruntland Report (1987) and Agenda 21 (1992), the interpretation of concepts 'sustainability' and 'sustainable development' have been marked by rather extensive diversity. A number of concepts have been used in education. For example, harmonious, coherent, caring, long-term, future-directed development, and other terms are still used as synonyms to denote sustainability and sustainable development. Also, as a basis for these different interpretations, mostly anthropocentrism and, very seldom, ecocentrism has been considered. Anthropocentrism exaggerates the significance of human beings in the biosphere and convinces us about the capability of human beings to understand and control natural processes in a desirable direction. On the other hand, ecocentrism is looking for ways of creating cohesion with human life and life-supporting systems, as complementary components within the ecosphere. A sense of attachment to the ecosphere provides the foundation for conviction and responsibility in the context of ecocentrism. Anthropocentrism and ecocentrism allow the discernment of ***two easily identifiable levels of study that search for solutions in education*** toward sustainability.

Both levels of seeking solutions for problems of sustainability/sustainable development have been gradually adopted and developed ***in the teacher education curriculum. Currently, they can be discerned as typical approaches to education.*** When energy connections and resource exploitation are studied, anthropocentrism becomes the dominating orientation in education and constitutes the foundation of curriculum. When the psychological relationship with ecosphere is examined, the basic aspects of curriculum are searched for in anthropocentrism and/or ecocentrism. Therefore, within the curriculum, the aim of human actions and education for sustainable development can be derived both from anthropocentrism and ecocentrism. Regarding genuinely sustainable development, its aim should be derived from the context of ecosphere, as it is more extensive and sustainable in its essence than by taking a purely anthropocentric view.

> The research under review presents one of the tasks performed as action research initiated at Daugavpils University with the aim of reorienting the teacher education towards sustainable development and extending understanding of anthropocentric and ecocentric approaches surrounding sustainability.

Data obtained from qualitative analysis provided the general picture of three well discernible approaches to the selection of principles of education that aims for sustainable development.

These approaches to the aim of education can be viewed as general structures applied by the participants of action research to articulate the aim of education. The investigation of the foundations of these structures in the context of anthropocentrism/ecocentrism can help to evaluate the ecological potential of these structures and define the properties inherent for the teacher education program students' attitude.

Methods and assignments of case study

The case study was intended as one of the tasks within the action research initiated with the goal of reorienting teacher education towards the aim of sustainable development in Daugavpils University.

Case study was realized on two levels:

1. The general situation about the usage of the anthropocentric, of the joining of anthropocentrism and ecocentrism, of ecocentrism approaches in the explanation and definition of educational aim and sustainable development.

In order to clarify the actual situation 408 part time and full time students were involved in the action research from preschool and primary school specialties. They worked in 80 work groups.

The assignments were included in practical classes of the study course named "Environmental Education". The students received two assignments to articulate the aim of education for two different tendencies. In the third assignment the students were asked to choose the principles for "education for sustainable development" (without the concept being explained before the assignment). In Latvia the initial translation of concept 'sustainable development' was closer to the concept of coherent development and only the recently this meaning has been transformed into the 'long-term development'. Therefore, the concept as it has been used internationally is not habitual in the public circulation and school curriculum has not introduced this concept yet.

The assignment was completed through co-operative work in group, within the methodology of a workshop. The reports submitted by the groups provided the data for the qualitative analysis. The reports contained the most essential definitions created by the groups according to the instructions.

2. The differences of views of the preschool/ primary school and natural science professional program students with an aim to search for the ways to reorient the study courses towards sustainability and sustainable development.

The general views that were expressed by 80 (full time) preschool/primary school professional program students (18 work groups) were compared with 30 full time natural science study program students (9 work groups). We offered the students involved in natural science study program to take part in action research based on the study course "The integrated natural science".

The acquired views were offered to the students for the re-identification and re-evaluation in the context of sustainable development and sustainable education. The participants of the action research were invited to evaluate a text corresponding to the discussion and case study content at the conclusion of the discussion.

The general scene of research, the comparison of the views, the discussions and text analysis has provided the opportunities to improve the study courses and reorient them towards sustainability.

The content and instructions for group work

- Three assignments were used for the clarification of the general situation.

In the first two assignments the students were asked to answer the question "What is good education?" The answer was to be found by defining the aims, principles and expected results of this education.

Each assignment was supplemented by different instructions determining the search for the aim of education.

The instructions of the first assignment asked to focus merely on one essential feature sustained by education, i.e., on the ability of human beings to create and maintain a diversity of social relationships such as individual to group; group-to-group; and different groups to global society.

The instructions of the second assignment asked to define the aim, principles and expected results of education conceived in a wider context of cosmological processes of self-development and self-realization.

By means of these assignments the students engaged in the research become acquainted with the two different views on the aim of education. These views conditionally can be called: education for "the human beings as a species, emphasizing the context of social relationships", in the first assignment and education for "the human beings as a species among the species" in the second assignment, stressing the context of ecosphere. As the titles for the cases, terms suggested by O'Sullivan (1999) were adapted.

- The assignment of text analysis.

The text offered for the critical evaluation was shaped using the fragments of O'Sullivan's work. It was adopted for the needs of the case study. We agreed with the participants of the action research that the following criteria would be observed for the evaluation of the text: familiar/already known thought; significant thought; not

understood thought; new finding. The respondents could mark the accepted notions at the paragraph or at the separate sentences according to one's own preferences.

Results

The analysis of results was performed focusing on the:

- Need to delve into the conclusions articulated in the action research (2001) with a target to discern the teachers' views on the aim of education for sustainable development (Salite, 2002). During this stage of research it was discovered that full-time and part-time students engaged in this action research grounded their collective opinions on the aim of education for sustainable development on three different approaches: a) most often on anthropocentrism, b) less often on the joining of anthropocentrism and ecocentrism when the former was supplemented by ecocentric features, and c) in some cases on the basis of ecocentrism. This conclusion provided by microanalysis was selected as a research task for a deeper qualitative analysis.
- Need to identify the basic categories and subcategories as well as their features and dimensions to put them in a wider context. To provide the extensive qualitative analysis this identification can be performed by means of analytical process of open coding/decoding.
- Need to evaluate the students' views on sustainable education by distinguished categories, its' features and levels due to discover the attitude properties of participants and related content essential for teacher education curriculum.
- Need to search for propositions for the development of teacher education study course programs and the reorientation towards sustainability.

Article presents the results of open coding/decoding and subsequent conclusions

During selective coding/decoding the concept of sustainable education was adopted as a basic category and interpreted by several versions elaborated in students' groups. Interpretation of concept of sustainable education analyzed from philosophical point of reference provided three approaches: 1) interpretation of sustainable education based on anthropocentrism, 2) interpretation of sustainable education based on the joining of anthropocentrism and ecocentrism and 3) interpretation of sustainable education based on ecocentrism. These approaches were assumed as the subcategories. Each of these subcategories was discerned as a distinctive structure used by respondents to construct the opinions while potentially implying the diversity of more or less extensive scope of features within a single approach.
New ways of study course perfection and reorientation towards sustainability and sustainable education like "Environmental Education" and "Integrated Natural Science" were searched for in the results acquired through the comparison of students' views and text analysis involved in different programs.

General approaches of interpretation of sustainable education
Approach 1 – interpretation of sustainable education based on anthropocentrism

Interpretation of sustainable education based on anthropocentrism was discerned as a structure focusing on values significant for the human being as a species. These values are used for the selection of aim of education. The approach was preferred by 65 per cents out of 80 activity groups (each containing five students on average). Within a mentioned approach general and specific features of group opinions were analyzed and subcategories based on different leading values and consisting of various central components were discovered.

Process of selective coding resulted in eight groups of opinions with various focal points on sustainable education grounded on anthropocentrism:

1) sustainable education;
2) focus on the development of individual;
3) caring, protecting education;
4) transformative nature of education;
5) ethical, spiritual education;
6) holistic education;
7) technocratic education;
8) normative education.

Extension of categories by their immanent features reflected the points of reference for the aim of education and related features of pedagogical process (see Box 1).

Box 1
Groups of opinions based on anthropocentrism

1. **sustainable education –** fosters the development of spiritual, liable identity conformable with environment and culture by means of development through environment and succession of generations; pedagogical process conformable with environment and culture, grounded on an activity approach;
2. **focus on the development of individual** – spiritual (ecocentric, altruistic, biotic, tolerant) optimist with an orientation toward a coherence. A list of individual qualitative features is utilised as a background for this opinion;
3. **caring, protecting education –** with a goal to promote the critical thinking, ecological culture and perception of world's value;
4. **transformative nature of education** – conviction that education can provide the qualitative attitude changes. Need for transformative approach to change present attitudes in education (anthropocentric);
5. **ethical, spiritual education –** construction of environment for learning and spiritual development in context of humanism and applicable knowledge. Humanistic pedagogy, acquirement of theory and practice within the activity approach;
6. **holistic education** – spirituality and application of knowledge accepting the wholeness of world;
7. **technocratic education –** application of knowledge and opportunities of socialisation. Pragmatic approach;
8. **normative education** – improvement of acquired knowledge in context of social norms and interests. Normative, formative approach to education.

Analysis of eight groups of opinions on sustainable education grounded on anthropocentrism allowed identifying the following:

1. three aspects (contexts) sustainable education has a need to focus on were indicated: features or quality of individual, cultural context and ecological context. First opinion implies that sustainable education has to concentrate on all three aspects (contexts), second and third opinion emphasizes the features of individual and ecological context, opinions fifth to eight discuss the individual knowledge and spirituality in the context of social norms, demands and various needs;
2. identified opinions suggested a definite approach to the pedagogical process. Among these opinions the following approaches can be discerned:
   - approach oriented to the activity accounting all three aspects just mentioned and approach oriented to the activity considering individual features and quality in context of social needs and demands;
   - need to construct a learning environment for ethical, spiritual individual development (normative, formative approach);
   - need to focus on transformation of present attitudes (transformative approach).

Approach 2 – interpretation of sustainable education based on the joining of anthropocentrism and ecocentrism

Interpretation of sustainable education based on the joining of anthropocentrism and ecocentrism was discerned as a structure where ecocentric features supplement the anthropocentric assumptions. This approach was preferred by 30 percent of questioned working groups.

Process of selective coding allowed finding out seven groups of opinions on sustainable education grounded on the joining of anthropocentrism and ecocentrism:

1) education oriented toward an ecological person;
2) preservation of identity, culture, and environment;
3) inquiry into a world;
4) awareness of sustainable development;
5) education with a liable, co-evolutionary nature;
6) education oriented toward attitude, sense of home and place;
7) education oriented toward coherent relationships.

Extension of categories provided a subsequent picture (see Box 2).

Box 2
Groups of opinions based on the joining of anthropocentrism and ecocentrism

1. **education** oriented toward an ecological person – spiritual development (ecocentric person, enjoying his/her work). Construction of learning environment for self – development and application of one's facilities;
2. **preservation** of identity, culture, and environment – identity and culture in ecological context. Foundations of communicative culture in pedagogical process;
3. **inquiry into a world** – immersion in a world, joining through senses and spiritual (deep ecological) development. Epistemological diversity;

4. **awareness** of sustainable development – focusing on the links between generations and intergenerational transference of experience. Formative approach grounded on traditions;
5. education **with a liable, co-evolutionary nature –** self-inquiry in relation to Universe, space and time. Important feature – liability and co-evolution. Distinctively cosmological version;
6. education oriented **toward attitude, sense of home and place –** acquaintance with a diversity, living ethics, connection with Universe. Distinctively cosmological version;
7. education oriented toward **coherent relationships** – focus on unity of everything, ecocentrism. Ecosphere context awareness).

Review of seven groups of opinions on sustainable education grounded on the joining of anthropocentrism and ecocentrism allowed discerning the following:

- cosmological and ecosphere contexts comprising the individual and cultural aspects; more general, complicated concepts inherent for sustainable attitude or education have been applied for (identity, spirituality, co-evolution, living ethics, development in line with a principles of deep ecology, etc.);
- demand was emphasized for the organization of pedagogical process – need for the creation of learning environment. Different aims of learning environment were proposed: 1) self-development and actualization of one's facilities (self-inquiry in relation to Universe, space and time), 2) acquirement of cultural traditions from previous generations; 3) preservation of identity, culture, environment grounded on the communicative culture in pedagogical process.

Approach 3 – interpretation of sustainable education based on ecocentrism

Interpretation of sustainable education based on ecocentrism has a trend to derive the aim of sustainable education from ecocentrism. This trend was found among five per cents of questioned groups.

As a result of coding four opinion groups on sustainable education grounded on ecocentrism were discovered:

1) education focusing on a co-evolution of humans and nature;
2) life as a value;
3) coherence with environment based on awareness and empathy;
4) coherence with environment b ased on traditions and experience.

Extension of categories by the specific features provided the subsequent scene (Box 3):

Box 3

Formatted

Groups of opinions based on ecocentrism

1. education focusing on a **co-evolution of humans and nature** – ecological person endowed with the diverse senses, affects and modes of thinking. Pedagogical process grounded on ecological identity;

2. **life as a value** – rational (unity of theory and practice) and deep ecological joining in the system of life. Life unity context;
3. coherence with environment based on **awareness and empathy** – ecological context through the empathic knowledge;
4. coherence with environment based on **traditions and experience** – ecological context of traditions and experience).

Analysis of four groups of opinions on sustainable education grounded on ecocentrism allowed distinguishing:

- individual aspect comprehended as ecological self (empathic mind) and ecological identity, cultural aspect stressing the traditions and experience;
- identified opinions suggest a definite approach to the pedagogical process: need to be supported by ecological identity, need to apply the contexts of cultural traditions and experience, life unity and deep ecology contexts.

Comparison results of sustainable education interpretations

The full-time students of preschool and primary school programs who worked in the groups expressed an opinion that sustainable education can be explained grounding it on anthropocentrism, on joining of anthropocentrism and ecocentrism, and ecocentrism (see Box 4):

- The offered viewpoints based on anthropocentrism differ according to the characteristics; among them there are views both with sustainable character, both technocratic, limiting or protective ways of viewing things. They are marked according to dominating o r characteristic features that the respondents have emphasised in their comments;
- two types of viewpoints were offered on the basis of integration of anthropocentrism and ecocentrism;
- one type of viewpoint was worked out on the basis of ecocentrism.

Box 4
Views of full-time students of preschool and primary school programs about the features of sustainable education

Five types of viewpoints were offered **on the basis of anthropocentrism**:

1) **Sustainable**: *succession, the experience of generations, *humanistic, oriented towards future, *responsible for the consequences, *development not disturbing other living beings;
2) **Technocratic**: *practicality, *an opportunity of socialization, *knowledge, its application;
3) **Preventive, safeguarding**: *interaction of people and the world, *the interconnectedness of things, *the world as value, *ethical and safeguarding;
4) **Rationalizing, limiting**: *in the interaction of people and the world, *in the interconnection of things;

5) **Ecological according to separate features**: *tolerant, harmonious; *spiritual, biotic, * altruistic; * directed towards the development of an individual;

Two types of viewpoints were offered **on the basis of joining of anthropocentrism and ecocentrism:**

1) **Harmony in relationships**: *in the interaction of people and the world; *harmony in the interconnection of things; *ecocentrism in all modes of relationships;
2) **Awareness of life's value**: *information and knowledge for spiritual development; life as fragile, unique phenomenon that can be damaged by any interference;

One type of viewpoint was worked out **on the basis of ecocentrism**. As its foundation provides the **recognition of person's and nature's co evolution**: * a person is not created for domination over the nature; the development of diversity in thinking; the capacity to be in cohere with nature and other species.

The full-time students of natural science teacher programs grounded their viewpoints only on anthropocentrism. This range includes orienting towards the development of an individual, harmony, ethics, ability of competition, egocentrism (see Box 5).

Box 5
Views of students of natural science teacher programs about the features of sustainable education

The full-time students of natural science teacher programs grounded their viewpoints only on anthropocentrism. Four types of viewpoints were offered:

1) directed towards the **development of an individual**: *reasonable usage of the resources; *education that promotes the development; * the ability to make relationships; *understanding, respect;
2) **harmonious, ethical**: * the ability to understand other people; *development of people; *coherence, harmony, love;
3) **competitiveness**: *conformity or competition; *the ability to defend oneself, to compete; *continuation of the generation; committing of experience;
4) **egocentrism**: *the formation of a human species capable to compete; * the development of instincts and organism; everything serves for a human being; *a human person as the most developed among species;

The views of preschool and primary school speciality students differ from the views in natural science study programs involved programs because they are offered different study courses, in the process of which acquisition this case study was realized. In the programs of preschool/ primary school – the course of environmental education; the educational programs of natural science – within the framework of integrated natural science course. A partial integration of the subjects of animate and inanimate nature is used as its foundation.

The results of text evaluation

In the attitude towards the offered text content it wasobserved that the responses were made in different ways. Some parts of the text comments were marked more than others. Most frequently commented text was the following (Box 6):
Most of the respondents conformed thetruth that a human person has changed his/her commitment to the earth and in such a way the harmony in the relationships of a human person and the earth has been thwarted. The respondents identified two kinds of needs – a human being as species among other species and the needs of a human person as species. It was declared that the first is to be developed; the second is the most characteristic for our relationships with other living forms. The respondents distinguished that both these kinds of needs are interconnected and complement each other.
The need for the transformation of a human being was identified as a new finding that transcends the limitations of modernism and at the same time recognizing them and the educational need for cosmology in which the well being of the planet determines the welfare of a human person.
The text was accepted as not comprehended where the need to develop the planetary awareness and the attitude towards the world's integrity were observed. The text also included the need to learn to see the impact of economics in global context where its destructive power is disclosed and interrelationship among the attitudes of groups and individuals searched for.

Box 6.
The sections of the text commented by more than a half of respondents (the text is provided in a concentrated form to characterize its essence)

As already known and a significant thought:
- the impact of the human person on nature disrupted the balance during the industrial era. The notion that the earth can be detached from a human being as an object and manipulated serves as its foundation. Earth as an object means that we have ignored the historically inherited wisdom.

The following thoughts were acknowledged as significant:
- we will not understand the world until we will not start to think about ourselves as species among other species;
- for present we think about a human person in the framework of nations, cultures, thnic groups, international organizations, global society, but they do not emphasize the person-earth problems so precisely as it is when we consider a human person as species among other species.

As a new finding:
- more adequate cosmology should be projected in education, the well being of the earth should be emphasized as a well being of a human person;
- modernism has fulfilled all that it could achieved, now its limitations (rationally-industrial) can be compared to self destruction; evolutionary transformations is needed that would transcend modernism and at the same time accepting it.

As an important, not understood thought:

- we can equip students with a vision in which they would discover their individual "I" in connection with the higher "I" in beauty that is around us;

As not understood:

- right now the destructive force is the transnational economy globalization;
- it is necessary to develop the planetary awareness in education that generates the awe before the world and guides us further than the vision of the market;
- if the dream and the vision are creative then any dedication that loses the integrity would lead us towards destructive changes. It happens with politic ideologies, religious visions.

The part of the text that was seldom commented (up to 10% of the respondents), suggested the following responses of the respondents (Box 7):

The idea was recognized as known that spirituality has had, has and will have the diversity of expressions.

The orientation of the culture towards spirituality and its development was recognized as significant.

The theme about the social and ecological "I" in the context of cosmologic identification and planetary awareness was recognized as important, but unintelligible.

Box 7
The fragments of the text commented up to 10 % of the respondents (the text is provided in a concentrated form to characterize its essence)

The already known and familiar thought:

- the existence of spirituality expression diversity has been, is and will be;

The significant thought:

- to develop culture that would facilitate a person to be active in the formation of righteous, compassionate and joyful world, to care for it;
- to cultivate, to educate, to develop the ideals of compassionate, democratic society;
- to develop a responsible culture and attitudes;

The significant and not understood thoughts:

- facilitation of the significance formation process;
- identification with nature and humanity, aspiration for harmony, peace, righteousness (cosmological identification) with competitive responsibility;
- no motivation to educate spirituality;

According to the acquired criteria there are the following results (Box 8):

The following thought was recognized as already known that the foundation of curricula and study programs can be found in anthropocentrism and it is necessary to reshape this foundation trying to find deeper coherence with the world. The need to see the human beings as species and as species among other species is regarded as the foundation of this search and their complementarities should be taken into consideration.

The text parts were identified as a new finding in which the ways were offered how the inherited stereotypes of anthropocentrism and modernism that have accumulated in science, religion, culture and the consciousness of individuals could be changed to the

facilitation of planetary awareness development where spirituality would transcend the vision of the open market.
The fragments of the text were recognized as incomprehensible where the aspects of economy, ecological, spiritual and cosmological interconnection were observed in broader philosophical view and taking into consideration their interrelation.

Box 8

The choice of text fragments according to criteria (familiar/already known thought; significant thought; not understood thought; new finding)

The following thoughts were acknowledged as known:

- the relationships of people with other living beings in the world are not sufficiently observed in the curricula and study programs;
- we have wasted the nature resources, the existent educational goals and forms should be critically reviewed, more appropriate cosmology should be foreknown in education, the well being of the earth should be emphasized as the well being of a human person;
- if we think about the world in which we live then we have to mind the forces that operate in the educational programs; we can't live only for ourselves, our inner world resembles the outer world, we can't develop our inner world without the beauty of the outer world, we will die without the life surrounding us; our emotions, imagination, intellect, out souls would disappear.

The following thoughts were acknowledged as significant:

- we will not understand the world until we will not regard ourselves as species among other species;
- right now we think about the human being in the framework of nations, cultures, ethnic groups, international organizations, global society, but it does not emphasize the problem of the interconnectedness of a human being – the earth so promptly as when we think of a human being as species among other species.

The following thoughts were acknowledged as new:

- we have inherited the religion of anthropocentrism and the heritage of science that offer rituals that do not address our need for the relationships with the earth;
- modernism has fulfilled all that it could achieved in this paradigm, now its limitations (rationally-industrial) can be compared to self destruction; evolutionary transformations is needed that would transcend modernism at the same time accepting and including its expressions.
- it is necessary to develop the planetary awareness in education that generates the awe before the world and guides us further than the vision of the open market;
- we start to see the forms and rituals of spirituality in which the interconnectedness of a human being and other living beings is recognized;
- the universe is the primary university; each profession and activity is connected with the integral functioning of the planet; the earth is the first pedagogue;
- there is no place for spirituality in global economy.

The following thoughts were acknowledged as incomprehensible:

- now the destructive force is the globalization of transnational economy;

- there exists another kind of globalization, it recognizes the local bio regions, expresses the interconnection among all components of earth community;
- if the dream and the vision are creative then any dedication that loses the integrity would lead us towards destructive changes. It happens with politic ideologies, religious visions.
- it is necessary to develop the planetary awareness in education that generates the awe before the world and guides us further than the vision of the open market;
- our interrelation with the universe invites us into a broader context. We become spiritual with our participation in the spiritual dimension that is characteristic for the universe. We are connected with the earth and it is one of the preconditions for us to become mature human beings. Our souls grow in the matrix of the earth. If the matrix is polluted, it has an impact on the development of the human soul. It is not only a metaphor to speak about earth as a mother. Being connected with the earth we are species among other species.

From the text analyses it is visible that the limitations of anthropocentrism are approved as a reality.
The aspect of spirituality is acknowledged as incomprehensible. It marks the direction of vital first-hand needs to at the issue of sustainable education.

Suggestions for the improvement of teacher education curriculum

Results obtained within action research suggest some reference points for restructuring and development of study course "Environmental education" toward the idea of sustainable education.
Therefore, analyzing the results from the axiological point of view (assuming an operative definition that values are one's conception about the preferable) within the opinions of students provided as an interpretation of sustainable education on the basis of anthropocentrism, joining of anthropocentrism and ecocentrism, or on the ground of ecocentrism two aspects could be noticed. First aspect is values or contexts pointing to the priorities for curriculum content's selection and second is values suggested as a background in the organization of pedagogical process.
Interpretations of sustainable education based on anthropocentrism singled out the individual (peculiar features or quality), cultural and ecological context as values or contexts important in the selection of content. Some cases were found among the presented opinions containing all three values or the combination of two (individual and ecological context or individual and cultural context).
In regard to the content of study course "Environmental Education" these proposals can be considered through an issue emphasized by Bowers (1995). He has suggested the necessity to discern the aspects of individuality, culture and ecology in education, at the same time turning to the creativity, intelligence, etc. One of the tasks set for a content of sustainable education is re-evaluation of central pedagogical issues, concepts, and ideas from the point of view of connections between the individual, cultural and ecological contexts. Many pedagogical ideas and even the approaches fail to meet these requirements focusing mainly on separate values or engaging in one-sided or rather superficial evaluation of connections between these three components.

As valuable contribution for the implementation of pedagogical process the following ideas can be borrowed from the research:

1) activity approach focusing on the individual, cultural and ecological context or with orientation toward the individual and cultural context;
2) need essential for the traditional (formative) approach to take care of creation of learning environment facilitating ethical and spiritual individual development;
3) appeal for the transformative approach to change the present attitudes of humans.

These opinions raise an issue about the complementarity of anthropocentrism and different pedagogical approaches as well as the evaluation of its possible effects from the point of view of sustainable education. This gives an opportunity to analyze the development of education grounded on anthropocentrism and its attempts to extend the anthropocentric view with ethical, ecological and spiritual values.

Within the interpretations of sustainable education based on the joining of anthropocentrism and ecocentrism following values or contexts important in the selection of curriculum content were suggested: individual (specific features or quality), cultural context and ecological context. However, these values were not enlisted or presented in specific order through a linear connection. In these cases the cosmological or ecosphere contexts comprising individual and culture (social relations) were distinguished. Application of more extensive context fosters the selection of more complicated concepts (identity, spirituality, co-evolution, living ethics, deep ecological development) marking the necessity for person's authenticity, mission to create spirituality, co-evolutionary bonds with eco-sphere.

Within an environmental education this issue has been introduced by the development of holistic ecology and deep ecology gradually growing into the ecosophical ground for environmental education. Values intrinsic for these views allow elaborating the approach to environmental education grounded on the joining of ecophilosophy and pedagogy.

Within the interpretations of sustainable education based on the joining of anthropocentrism and ecocentrism the urgent demand for the creation of learning environment can be found. This demand is derived from different cosmological and eco-genetic assumptions, reflecting an opportunity to obtain the truth from different sources via diverse experience and abilities, by communication and interaction of generations.

From the point of view of environmental education this is an issue related to the application of contextual learning, constructive approach, holistic child-centered or evolutionary patterns developed in education with the distinctive orientation toward the implementation of aim of sustainable development.

Interpretations of sustainable education based on ecocentrism provided two possibilities for the selection of values or contexts dominating in curriculum content: individual included in the ecological context and culture included in the ecological context. The degree of joining of individual and ecological context and culture and ecological context can be viewed as a deep integration (closer to homogeneous not heterogeneous state).

Within a content of environmental education this is an issue related to the ecological person and ecological culture.

Interpretations of sustainable education based on ecocentrism have an appeal to ground the pedagogical process on ecological identity; the necessity to apply the cultural traditions and experience, contexts of life's unity, emphatic knowledge and attitudes dominating in deep ecology.

Regarding the environmental education this issue is topical also for the teacher who operates not only on background of teaching technologies but also through his/her identity.

Suggested opinions were offered for the students' evaluation and identification. It was concluded that these opinions are a valuable tool to initiate the discussions on the aim and features of sustainable education. It was detected that using these opinions as background students could easily identify their own opinions. They are able to select the more sustainable versions and it is an opportunity for them to analyze their own opinions by the criterions and features obtained through the coding/decoding procedures within the qualitative research.

Versions identified in this action research can serve as an illustrative example for the present diversity pervading the issue of humans' attitude toward natural environment. This is a central idea in the content of environmental education. In line with it general views on the aim of environmental education and education for sustainable development can be developed; assumptions supporting different approaches can be analyzed; various views can be compared; concepts, their specific features and levels describing the different approaches can be selected.

Grounding on this general research – interpretation of sustainable education based on anthropocentrism, ecocentrism and text analysis, the reorientation of teacher education towards sustainability can be understood as a transition from curriculum that is shaped on the basis of anthropocentrism towards the curriculum formed on the basis of the complementarity of anthropocentrism/ ecocentrism principles. There are two ways in the quest of teacher reorientation towards sustainable development:

1. to offer the becoming teachers different opportunities for the discovery of diverse view and for the development of one's own point of view;
2. reorientation of program content towards the goal of sustainable education and development:
   a. More complete awareness and use of the inner pedagogical potential, reinforcing the responsibility, care for the concordance of the human person with the world;
   b. More complete usage of speculative nature of pedagogy. Coordination and integration of the development of pedagogic theories with the recommendations of holistic ecology and ecophilosophy;
   c. Reconstruction of the natural sciences content towards the principles maintaining the sustainable development (the interconnectedness of life and life support systems in ecosphere, dealing with the problem – a human being as species in the united life system and a human being as a cosmoplanetarian phenomenon).

References

Bowers,C.A.1995. *Educating for an ecologically sustainable culture: Rethinking moral education, creativity, intelligence, and other modern orthodoxies.* Albany:SUNY Press.

Fox, Warwick (1995*) Toward a Transpersonal Ecology developing new foundations for environmentalism*. State University of New York Press.

Gang, P.S. (1989). *Rethinking education.* Dagaz Press, Oakland, California, U.S.A.

Hutchison, D. (1998). *Growing Up Green: Education For Ecological Renewal*. New York & London: Teachers College Press, Columbia University.

Isaac, S., Michael, W.B. (1997). *Handbook in Research and Evaluation: For Education and the Behavioral Sciences* – 3rd ed. Edits/ Educational and Industrial Testing Services, San Diego, California.

Strauss, A. L. & Corbin, J. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* – 2nd ed. Sage Publications, California.

World Commission on Environment and development/WCED (1987), *Our Common Future*, Oxford University Press, Oxford.

United Nations (1992), *"The UN Conference on Environment and Development: a Guide to Agenda 21"*, UN Publication Service, Geneva.

O'Sullivan, E. (1999) *Transformative Learning: Educational Vision for the 21st Century*. Toronto, Canada: Zed Books.

Whitehead, A.N. (1967). *The aims of Education and other essays*. The Free Press, New York.

Salite, I. (1998). 'An ecocentric paradigm: an important tool for teachers of environmental education', *Australian Journal of Environmental Education*, vol. 14, pp.81-85.

Salite, I. (2002). Teachers'views on the aim of education for sustainable development, *Journal of Teacher Education and Training vol.1, 2002, pp.68-80*.

Yin, R.K. (1994). *Case Study Research: Design and Methods* – 2nd ed. (Applied social research methods series; v.5) Sage Publications, California.

Return to Contents

34. MINT - a National Initiative to Promote Greening of the Curriculum

Kaisu Sammalisto

University of Gävle, Sweden

Keywords: Curriculum, Environment, Greening, Initiatives, Sustainability, University

Abstract

This paper presents the national program of promoting the greening of the curriculum in Swedish universities. A brief presentation of the initiatives taken during its ten years is given and the effects of the program evaluated.

Introduction

The future generations of mankind will meet challenges that previous generations did not even dream about. The challenge of moving society towards sustainable development is one of the major ones. The Swedish government became aware of this at an early stage and took a strong initiative for the greening of the curriculum. Teaching today's students, who make the leaders and decision makers of tomorrow, would be part of the solution.

In February, 1991, the Swedish Government presented an Environmental Protection Bill which was later to become the 1991 Environmental Protection Act. This bill emphasises the importance of education and gives directives about the integration of environmental issues in the regular programmes.
"To make this come true is a considerably more difficult task for the institutions of higher learning than to treat the environment issues as separate, isolated elements that can easily be added to existing programmes. To realise this task a strong support for the academics in the university system is needed, through in-service training, through development work and through the production of textbooks. The Government therefore proposes that special resources are made available for this purpose…" (Regeringens prop.1990/91:90, p 208).

The funds, SEK 8 million for a period of two years, were particularly to be used to promote the environmental integration in regular educational programmes, special staff development initiatives and support to development efforts primarily in technology, administrative and economic professions, and teacher training.

In March 1992, the formal assignment to form what is now called the MINT-programme, [1] was given by the Government, to the Council for the Renewal of Higher Education. [2] A special Committee to carry out the assignment, the MINT group, was also created in early 1992. It consists of teachers and students who represent knowledge and experience from many different areas and share an interest in developing sustainability in higher education. A part time (25 %) executive member is employed to effectuate the

group's initiatives and contacts. Administrative support is received from the Council secretariat.

The original focus on promoting environmental issues has later been turned to the wider concept of sustainable development.

Greening projects

The activities initiated and supported by the MINT group have varied through the years. The most important task is to encourage Swedish universities and university faculties to integrate environmental issues into the regular curriculum and regular programmes and since 1992 some 35 projects, at 20 institutions of higher education, have received project grants. Even though the main focus has been on engineering, economics, and teachers training, the Council later added other dimensions allowing different kinds of institutions to participate. Therefore a variety of other fields, such as design, tourism and restaurant programmes have also been included. All projects have been initiated based on to an invitation to apply given to a few specific universities.

The Council also decided to fund a Library Project which, among other things, built the first version of the MINT-groups webbsite and supported the various greening projects with literature.

Disseminating information

The MINT-group considers that it is important to disseminate the gained information in many ways. Several good examples of greening have been found throughout the years, and in 2000 the Council published a collection of them, a Handbook presenting ideas on how lecturers have integrated environmental aspects and aspects on sustainable development in regular courses. Examples for English language, Physics, Business administration, Law, Life Cycle Assessment, Numerical analysis and Computer science, Sociology and Statistics can be found there. (Högskoleverket, 2000)

The group is now focusing on publishing examples of the scientific base of sustainable development in specific disciplines on a higher academic level and the best practice in them. The first book on economics is in progress and is expected to be ready later this year. The books will be written either in Swedish or in English, depending on the target-group. There is an agreement to co-operate with the Netherlands in this field, where already several books have been published in Dutch so far.

The MINT-group's webbsite contains a lot if information and links to a number of interesting domestic and international sites. Its purpose is to present resources for teachers, primarily in higher education, and to make available the results of the different

projects and activities funded by the group. The Handbook and reports from the curriculum greening projects and evaluations can be found there and they are available for downloading or printing without cost. Most of them are available also in English.

Furthermore, the MINT-programme was mentioned in the Swedish country report on the Baltic 21 Education Network. (Baltic 21 E, 2002)

Greenspiration Conferences

Since 1999 the MINT group has organised a yearly inspirational conference for teachers, students and environmental officers at the different universities. [3] The themes have varied through the years, but in addition to some specific topics and lectures given by teachers, industrial representatives have also presented their views concerning the expectations put on the students as they enter working life. An important aim has also been to provide those present with opportunities for informal talks involving exchange of experiences.

Co-operation with students

In the Swedish university system the co-operation with students plays an important role and students are represented in various organs. The MINT-group has two student representatives and a close co-operation with the Swedish Ecodemics, the students' environmental network. [4]

In 2001 the Council for the Renewal of Higher Education, through the MINT-group, financed the round table discussions, organised by the Swedish Ecodemics at 12 universities. To these discussions local university managers, teachers, students and other interested parties were invited. The aim was to support each university's work with sustainability issues in education and to put forward possibilities for further engagement. The national round table discussion in Stockholm finalised the effort. The Swedish Ecodemics then published a report on the project including conclusions and suggestions for the future. (Friberg, 2001)

MUtA award

On May 4, 2001, the Council for the Renewal of Higher Education and Swedish Ecodemics for the first time granted two persons for the MUtA award. [5] This is an award given to lecturers of any discipline at Swedish Universities who have been successful in teaching sustainable development. The nominations were put forward to the MINT-group by students, colleagues and/or university management. A consulting group consisting of a representative for students, teachers, NGOs and industry made the final choice for the winners. The award is a scholarship of SEK 30,000 for competence development for example by covering travelling expenses to attend a conference or to visit a university abroad. The winner receives a diploma and a box of ecological hand made chocolates with the MUtA-logotype.

International contacts

In 2000 a group of 25 teachers, administrators, and students made a trip to the Netherlands to study the initiatives and experiences of teaching sustainability there. This resulted in further contacts and new initiatives in promoting student learning in interdisciplinary groups and in producing the above mentioned series of booklets dealing with sustainability issues in different disciplines.

Apart from the close contacts with the Netherlands and early on some in the UK, the MINT group has participated in the European auDes programme, [6] which was launched in 1994 in Stockholm. The main purpose of auDes is to link academics and departments in Europe in order to improve environmental education and research at universities. The Essence network later took over the role of auDes and there are now about 150 members from 15 countries. This programme and network has arranged six conferences on various subjects related to its aims. The MINT programme has also participated in compiling the Swedish national report for the report on the environmental labour market in Europe. (Sammalisto, 1999a)

Evaluation

Greening projects

The effects of the greening projects were evaluated in a survey mainly among engineering and economics students at 18 universities in 1999. The survey was performed with the aid of local university staff or students. All students in particular classes in session were asked to fill in the questionnaire and the papers were collected on the spot to assure highest possible reply frequency of the class in question. The students were asked to specify their programme or the subject area of their study; the subject areas where they had experienced greening; whether they had taken compulsory and optional environmental courses; whether they lacked greening in their subject areas and whether they experienced their university to have greening ambitions.

Although the greening effect can be the result of many different factors at the particular university and in surrounding society, the results suggest that in many places the students were aware of greening input in their study programmes indicating that the projects had left some results. This was the case especially for the smaller universities. In the table below a summary of the results for the economics and engineering programmes is given.

'Take in Table I'

Initially the projects were launched based on approved applications, which in turn were based on invitations directed to different universities. Since 1998 the MINT-group has not initiated any new specific greening projects at institutions though there is a possibility

that such support may be given for projects integrating aspects of sustainable development in the future.

Disseminating information

The Handbook has been received well and has been reprinted twice. The comments from the universities of its practicality and hands-on approach have been positive. The MINT-group sees a need for more material and resources, which support the teachers and institutions in their greening efforts.

The MINT-programme's webbsite is the one most frequently visited at the Council server, which indicates that it is both rather well-known and that it provides useful information.

The disciplinary booklets will also be available on the webbsite probably in the beginning of next year.

Greenspiration Conferences

The four Greenspiration conferences that have been arranged up to now have gathered around 40 participants each year. They have, in their evaluation comments, expressed the value of such a gathering just for what it is intended for, that is, inspiration in the form of relevant presentations, discussions, and new contacts with colleagues at other universities. However, the conference has not developed into a larger gathering, which indicates that it is still a rather small group of people, who are dedicated to promoting the issue.

Co-operation with students

It is characteristic of all student activities that those engaged in them tend to stay a short time. The usual period is one or two and, at the most, three years. This can create problems as regards continuity and long term projects. However, the students who are involved in the MINT-groups activities are enthusiastic and engaged and have many creative ideas. Even though they lack experience and resources, they are invaluable in creating contacts with various interested parties, and have a voice in t he different organs of higher educational institutions.

MUtA award

The MUtA award has so far been granted only once, but the evaluation made among some of the 27 nominated, representing 14 institutions of higher education, and the two who received the award indicates that it has reached its aim to focus on sustainability issues in education. The news of the award in the local press of the winner's hometowns and at their universities created quite a lot of attention. The evaluation showed that, even though, the selection procedure needs to be adjusted, even a nomination by students or colleagues is a great encouragement for a teacher.

International contacts

The international contacts with the Netherlands have been rewarding and mutually encouraging. The representatives of the MINT-group have regular meetings twice a year with their Dutch counterparts for updates and in order to develop the co-operation further. The study trip for the Swedish university representatives in 2000 resulted in a number of remaining contacts between the participants, but unfortunately the contacts in the UK have more or less ceased.

The activity within the Essence network has been and the Baltic 21 agreement between the countries in the Baltic region will be a good base for developing the co-operation and for sharing the experience from the greening efforts in the area. Due to the newness of the initiative the results will be seen only in the future.

Generally speaking there is openness within the MINT-programme to learn from experiences in other countries and to try and facilitate networking between Swedish teachers and institutions of higher education and those in other countries.

The results of the total MINT initiative can be summarised:

+ work on a broad front with many initiatives
+ has engaged many universities, many of the faculty and students
+ some results appear to remain
+ has put the spotlight on the issues of education for sustainable development
+ the project grants have given some merit to the project directors in the eyes of their colleagues
+ more students receive an education which includes environmental or sustainability aspects in their field than would be the case without the MINT-initiative
+ valuable support for those active in the field at different universities

- has not reached an ongoing movement and critical mass
- results are difficult to show
- it appears to be difficult to attract new projects for financing
- no new specific 'greening funds' to invite applications on since 1998
- dissemination of project results to a larger group of teachers in higher education has been difficult
- small personal resources in the MINT group in proportion to the size of the task

Conclusions

Most of us dealing with the greening of the curriculum and with environmental issues in higher education sometimes get disillusioned when we see all the obstacles in our way and when it feels like that, it is difficult to get response and see results.

That is why, at times, it is good to take a break and look back to see all that actually has been done through the years. It is easy to see that the MINT group has taken a lot of initiatives and worked on many fronts in promoting greening and sustainability issues among institutions of higher education. We do not have the numbers, but even with a modest estimation we can say that the activities of the group, in different ways, have engaged most universities and colleges in Sweden, several hundreds of faculty and staff and thousands of students. We must realise that most of the work done could be likened to the sowing of seeds, which can take several years, maybe even decades, to bear fruit. It remains for the Council or a future MINT group to evaluate the total impact of our efforts.

Notes:

1. MiljöINTegrering = Greening of the Curriculum programme
2. Rådet för högskoleutbildning in Swedish
3. Since 1997 all institutions of higher education have the directive from the government to implement environmental management system among over 242 public institutions.
4. Svenska Ekodemiker
5. MiljöUtmärkelse inom Akademin = Sustainability Award within the Academia
6. The Association of University Departments of Environmental Sciences in Europe.

References:

Baltic 21 E. (2002). *Agenda för utbildning för hållbar utveckling i Östersjöområdet – Baltic 21 E.* (Agenda for education for sustainable development in the Baltic region– Baltic 21 E). The Swedish Government. The Ministry of Education. Article number U02.007. Stockholm. http://www.ee/baltic21/. Accessed May 26, 2002.

Friberg, L. (2001). *Rundabordssamtal om integrering av hållbar utveckling i högre utbildning.* (Round table talks concerning integration of sustainable development in higher education). Svenska Ekodemiker. Stockholm. http://www.swedish-ecodemics.a.se/. Accessed May 26, 2002.

Högskoleverket. (2000). *Handboken* (Handbook). Högskoleverket. Stockholm. http://www.hgur.se/envir/index.html. Accessed May 26, 2002.

Regeringens Proposition 1990/91:90. *En god livsmiljö.* (Government proposition 1990/91:90. A good living environment). Stockholm.

Sammalisto, K. (1999a). *Higher Environmental Education and Environmental Labour Market in Sweden*. Essence network for environmental sciences. http://essence.vsnu.nl/servlet/nl.gx.vsnu.client.http.ShowObject?id=15100. Accessed May 26, 2002.

Sammalisto, K. (1999b). *Greening Experiences and Ambitions as Seen by Students at Some Swedish Universities*. Grundutbildningsrådet. Stockholm. http://www.hgur.se/envir/library.html. Accessed May 26, 2002.

Table I. Summary of the results for economics and engineering students. (Sammalisto, 1999b)

	Economics students	Engineering students
Number of replies	534	1020
Number of greened subjects	few	many
Compulsory environmental courses	4%	55%
Optional environmental courses	3%	18%
Lacked greening	30%	26%
Experienced greening ambitions	30%	65%

The author: Kaisu Sammalisto, Dean for Environmental Management and Education, University of Gävle, Department of Technology S-801 67 Gävle, Sweden, Tel: +46-(0)26-64 87 94, Fax: +46-(0)26-64 88 28, kso@hig.se

Return to Contents

35. Who Educates Who in Sustainable Development? Moral Fables from a European Teacher Education Project.

Tony Shallcross,

Institute of Education, Manchester Metropolitan University, U.K.

Abstract.

The focus of the paper will be on the role of higher education in teacher education programmes for education for sustainable development (ESD). The paper will trace the history of the Sustainability Education in European Primary Schools (SEEPS) Project which is a continuing professional development (CPD) and initial teacher education (ITE) project in ESD. It will critique the role of the university academic as critic in favour of a praxis based, Thoreauvian view of the academic as both theoretician and practitioner. Thus in order to facilitate sustainable development we need to scrutinise the morality of the narratives and fables which give meaning to our concept of professionalism in higher education (HE). The paper will outline; an argument for synergetic learning between school based practitioners and academics, a philosophy of ESD based on whole institution approaches, a five component model of whole institution approaches, a rationale, partly based on research evidence, for a school focused model of CPD in ESD, and a theory of change based on this synergetic learning. It will argue that ESD requires a transformations in our ideologies of childhood, the roles of academics, our views of the balance between theory and practice and where expertise in sustainable development lies.

Action as the Soul of ESD

Comment:

Definitions of environmental education (EE) and education for sustainable development (ESD) contain a consistent commitment to changing values, attitudes and actions. These three strands can be traced through discussions of EE to more recent considerations of ESD, in UNESCO sponsored conferences from Tbilisi (1978) to Thessaloniki (1997). Twenty years ago the purpose of EE was:

> To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes commitment and skills needed to p rotect and improve the environment; to create new patterns of behaviour of individuals, groups and society as a whole towards the environment (UNESCO, 1978. np).

By 1997 the exhortation was slightly different but clearly similar;

> ..the effectiveness of awareness raising and education for sustainable development must ultimately be measured by the extent to which they change the attitudes and behaviours of people as both consumers and citizens. Changes in lifestyles as reflected in individual behaviour, households and at a community level must take place (UNESCO, 1997, p.4).

In choosing these new patterns of behaviour for sustainable lifestyles we are making ethical choices. But we should not assume that new lifestyles necessarily imply more knowledge and/or new values. Aristotle recognised that actions and values are not always congruent (Table 1). Posch (1993) describes the failure to behave in a virtuous way as a discordance between espoused values and values in action. Individuals or organisations may not always be aware of such discordance; it may only become apparent through external illumination or evaluation. Research evidence shows that many students in initial teacher education (ITE) hold pro-environmental values, but they do not always act concordantly with these values, for a variety of reasons (Shallcross & Wilkinson, 1996). Therefore the neglect of environmentally sustainable actions may not always result from inappropriate values, it may instead indicate the need for education to empower, to develop conscientisation (Freire, 1972) or action competence (Jensen, 1995). The promotion of such action competence is a crucial but neglected feature of the education of teachers in higher education (HE) institutions (Shallcross & Wilkinson, 1998).

Table 1 : Aristotle's Account of the Relationships Between Knowledge, Values and Actions.

Cognition.	**Emotion**	**Action.**	**Relationship.**
Y.	**Y.**	**Y.**	Virtue.
Y.	**Y.**	**N.**	Incontinence.
Y.	**N.**	**Y.**	Control.
N.	**N.**	**N.**	Vice.

(Modified from Brennan, 1991).

In preaching the knowledge, theory and occasionally the values of ESD while neglecting action competence HE may be socialising hypocrisy by appearing to accept incontinent behaviour as normal. However, learners quickly spot this neglect when education addresses what ought to be done for sustainability in the formal curriculum but subsequently fails to develop appropriate institutional practices coherent with these espoused values. This neglect leads learners to question the integrity of their teachers (Titman, 1994) and forms a serious caution for the cognitive approach to ESD which so dominates ESD provision in ESD.

But action is not only privileged in ESD by definition. We also know that most existing models of EE and ESD are deficient and even when EE or ESD address action they do so from a suspect ideology of childhood. Uzzell et al. (1994) believe that EE has had a dubious ethical base because of its focus on behavioural change models that relegate child decision making. EE's objectives are not lifelong they are too youth and child focused and do not consider the socio-political contexts in which attitudes form. For these and other reasons EE has a dubious record in changing values and attitudes (Shallcross & Wilkinson, 1998) and lacks the socio-political and cultural contexts to facilitate change

through participation. Such behaviourally focused models communicate simplistic, atemporal images of reality that place insufficient emphasis on children's representations of the future. So EE lacks authenticity because it is implicitly concerned with educating children to be the change agents of tomorrow while ignoring immediate geographical and temporal problems. In citizenship terms it has considered children and young people to be citizens in waiting rather than present citizens (Alderson, 2000). Generally, EE does not treat children as equal and responsible partners in the agency of change, it has adopted a conventional ideology of childhood through models of social influence which assume that children are passive recipients of knowledge, with minority status, under the unidirectional and asymmetric influence of adults. This may, in part, explain why Freeman (1999) found in her research in Leeds that although environmental concerns are a high priority for young people 48% of those people she surveyed felt powerless because no-one would listen to their ideas about environmental change. Consequently ESD which only addresses cognitive gain is deficient as a model for the education of both children and teachers.

Sustainability as Theory, Practice or Praxis?

There are those (Gough, 2002) who defend the role of the university academic as theoretical critic in relation to the sustainable development debate, while asserting that classroom practitioners have to grapple with the meaning of terms such as sustainable development. This is not only a stance which invokes the modernist separation of professional and private roles (MacIntyre, 1996), it sees philosophy as an intellectual and not a practical activity and fails to acknowledge that education for academics and classroom practitioners alike is an applied discipline.

> To be a philosopher is not merely to have subtle thoughts, nor even to found a school, but so to love wisdom as to live according to its dictates, a life of simplicity, independence, magnanimity, and trust. It is to solve some of the problems of life, not only theoretically but practically (Thoreau, 1996, p.17).

While Gough states, quite rightly, that academics should not be placed under pressure to settle the meaning of sustainable development in absolutist or essentialist terms, this does not preclude them from involvement in the search for tentative meaning nor from the ethical responsibility as citizens to strive to act with some coherence in relation to these tentative meanings within and outwith their ivory towers. This is not the denial of deconstruction and critical analysis, but the recognition that these activities are not the exclusive territory of academics and furthermore that in the quest for ESD especially we have to assert the unity of human life, reconstructively, (Foster, 2002) by elevating the importance of praxis and the praxtitioner.

The role of academic as theoretical critic has two further adverse manifestations in the ESD debate. First, much writing about ESD gets drawn into a debate about language which is more about labelling than conceptualisation and more about problematising than deconstruction (Stables and Scott, 2002). For example education for sustainability (EfS)

is criticised for its unrealistic focus on product (Jickling, 1999, 2001) yet such criticisms evaporate if this label is attached to EfS as an education for process. By focusing on labels we may miss agreement about a fundamentally process based concept of ESD. Viewed from an adversarial perspective, the term ESD may be problematic, viewed from an inclusive perspective different terms may be employed to describe a similar concept. Does it really matter if I wish to call ESD sustainability education and others wish to call it environmental education or education for sustainability as long as we have this same process focused concept in mind? To some such labels appear critical. But in focusing on the problematics of terminology we may not only miss the potential to explore interactive spaces and overlaps but also alienate classroom practitioners from theoretical debate.

Secondly, the development of theories in social science has led to the development of schools of thought, the partisans of which bitterly attack members of other schools, while standing watch over their own side for any hint of ideological deviation (Paden, 1994). Much the same has happened in EE and ESD. Various schools of environmentalist thought have sprung up, from deep ecology to ecofeminism, and from environmental holism to neo-Aristotelianism. Despite being united by a common opposition to strong anthropocentrism (Sosa, 1996), enthusiasts of these schools spend their time, in the words of Stone, 'volley[ing] onto ... academic foes hypothetical quandaries that their principles cannot handle, or that they can only solve in a way that seems intuitively unsatisfactory' (Paden, 1994, p.62).

This modernist adversarial approach is self-defeating, in ternecine, uncivil warfare for ESD (Greig et al. 1989, Zimmerman, 1994, Paden, 1994) which renders discussions of ethical stances counter productive in an applied discipline such as education. The consequences of this formulaic negativity (Bowers, 2002) are either the progressive alienation of classroom practitioners by the adversarial rhetoric of environmental philosophy, or unwavering ideological dependency (Argyris & Schon, 1996). Fien (1995) describes this phenomenon as the language of critique which has had a paralysing impact on many environmental educators. Others find these debates spurious, unintelligible and consequently irrelevant. Consequently there is little praxis in EE/ESD. We have activity rather than theoretically derived action. In practical terms the concern with opposition has, through its elitism (Quigley, 1992), degraded the intellectual high ground of academic debate into swamps for professional practitioners. Educational theory must seek to elevate the praxtitioner as the real innovator in ESD, who by integrating theory and practice reveals praxis, rather than those academics who indulge in arcane, oppositional, often decontextualised, academic debate. In this sense the search should be more for pluralist inclusive theories of the middle ground (Paden, 1994) than the preoccupation with ideologically pure grand theory that currently dominates much academic discourse in environmental education and ESD. Theory is also important linguistically as it provides a new language not tainted by the prescription of policy makers or caught up with immediacy of practice (Ball, 1997). By elevating praxis above theory the praxtitioner be he/she in schools or HE may take over the prestigious role of innovator from the theoretically focused academic.

The Evolution and Devolution of SEEPS and School Focused CPD.

In 1996 the Learning for Life Group, an EE consortium of all institutions of ITE in Scotland, secured funding from the European Commission to develop a CPD programme in sustainability education (ESD) for European primary schools. This programme, which was based on an EE module that the consortium had developed for ITE in Scotland, became the SEEPS Project which involved participants from eleven European educational systems. The objectives of the Project (Box 1), were agreed at the SEEPS team's first seminar held in Edinburgh in June 1996; they show an initial commitment to whole school approaches to ESD. This commitment was essential to involvement in the Project as it had been the main feature of the initial bid for funding.

At the first seminar, the representative of each country or region provided baseline information on current CPD provision and needs in EE in their country or region; objectives 1 and 2 above. (The term EE was used at this stage as it was felt that teachers and SEEPS team members would find this term less problematic than ESD). After the design phase the Project had an integrated educational philosophy and theory of action. Philosophically, it was committed to developing whole school approaches to ESD. ESD has to be planned, done, in every sense of this word, and reviewed at a local level. The theory of action was based on school focused rather than centralised or school based CPD. School focused CPD means that the school is the locus of change. But unlike school based CPD, which may be supported by an untrained member of staff or externally produced distance learning packages, school focused CPD trains trainers and subsequently provides them with adaptable training materials which can support individualised CPD programmes in ESD decided in and by the school and its staff.

Box 1: The Objectives of the SEEPS Project.

1. Review the extent to which ESD is included in existing primary level CPD in the Europe based on the countries involved in the Project.
2. Identify current provisions and deficiencies, with particular respect to whole school approaches.
3. Utilise the experience of the Scottish Consortium and other partner institutions to design CPD materials which will encourage whole school approaches to ESD.
4. Foster international collaboration.
5. Promote a cascade model of ESD to meet the changing demands of CPD as school autonomy increases in many European countries.

The SEEPS team were committed to local, school centred CPD for philosophical reasons; it was a central feature of the educational ideology underpinning the Project. For most people, and children in particular the local environment is their most significant sphere of action. Local actions take on global character and by drawing parallels with other local communities, local action can become a microcosm of global action (Vognsen, 1995). Therefore CPD in ESD should be based on local school development (Evans, 1993). ESD is clearly for pupils' benefit, but schools are also workplaces for teachers and support staff so school centred CPD has to benefit several groups: pupils, teachers, support staff, parents and school boards or governors. Therefore CPD designed to promote ESD must

be relevant to and based in the local context through a focus at the school level. For ESD to be at its most effective, schools need to integrate with their local communities and to make appropriate global connections from these local links.

Research prior to the first meeting of the SEEPS team provided clear, pragmatic support for a school focused CPD model based on a training the trainers approach. Centralised CPD sees the initiation of change as externally driven; it rarely considers how institutional factors in schools influence change, nor does it often equip teachers with the practical skills to manage change within their own schools (Fullan, 1991). The research and Fullan's trenchant criticisms of this approach provided the evidence to eliminate this model from the Project for both practical and theoretical reasons. In some narrower content and methodological areas, such as the teaching of reading or mathematics, where the classroom teacher is the target of CPD, a centralised model can be successful. But in the field of ESD, where the whole school is the focus for change, it is a model with severe deficiencies.

School focused CPD offers solutions to many of the difficulties associated with a centralised approach, particularly if the school base ensures that staff development creates individual and organisational habits and structures that make continuous learning a valued and endemic part of the culture of the school; in short, the school becomes a learning organisation. Evans' definition indicates that a school base creates the opportunity for locally derived action to address the needs of both schools and individuals.

> It is school initiated in service education and is derived from the curriculum needs and plans of the school. It may focus on the school as a whole or in part (e.g. a subject department) as well as providing for the individual teacher's in service needs to be met (Evans, 1993).

Hewton (1988) identifies two other advantages of school based CPD, of particular importance to ESD. Firstly, schools as learning communities identify and solve many of their own problems, Secondly, schools sufficiently motivated by the greater control and direction they have over their own affairs find the resources to support CPD. However as Blenkin et al (1992) have pointed out much school based CPD can be founded on the pooling of ignorance. Hewton (1988) identifies other disadvantages of school based CPD. Parochialism is one; when schools and/or individuals find difficulty in learning from the experiences of other schools and/or trainers. Another problem is that the range of CPD activities is limited by the resources and expertise of the school's staff and its trainer/s. A third difficulty is that CPD only addresses the school's internal needs, resulting in a myopic focus which overlooks or neglects external circumstances. Who is CPD for the school or the teachers? Unless the answer to this question is clear, the interests of the latter may override the former or vice versa.

> As many of the agents in SBI [19] are teachers or former teachers, this is not always the case; they have to beware of not becoming the 'know all' but the guide who is going to help the participants onto the right track. It is stated that in many situations the agent's lack of expertise in team leadership and in presentation and communication skills has an adverse effect on the training programme (Evans, 1993).

Devolved school budgets in the U.K. have produced more school based CPD and further criticisms. Firstly, many administrative tasks, such as routine departmental or staff meetings, absorb CPD time. Secondly, schools are often not adept at identifying long term needs or needs which relate to their local environment; they tend understandably, to be preoccupied with the latest curriculum or inspection initiative from central government, or strategies which will improve pupils' scores in national tests.

But school focused education is more difficult in ITE. The way ITE has been addressed in the Project is through the development of a website (www.education.ed.ac.uk/esf) which contains the same commitment to whole school approaches as thee SEEPS Project and encourages praxis by requiring students to reflect on theory, case studies and their own experience of schools. The website is a strategy for encouraging whole school approaches in HE institutions which do not show a commitment to the integrated approach shown in Figure1.

Can We Be Modern and Moral? Practising What We Teach: Whole School Approaches.

> Schooling is only an accomplice in a larger process of cultural decline. Yet no other institution is better able to reverse that decline (Orr, 1994, p.25).
>
> In immediate terms, it means working to make the educational institution a microcosm of the emerging sustainable society, rather than of the unsustainable society (Sterling, 2001, p.33).

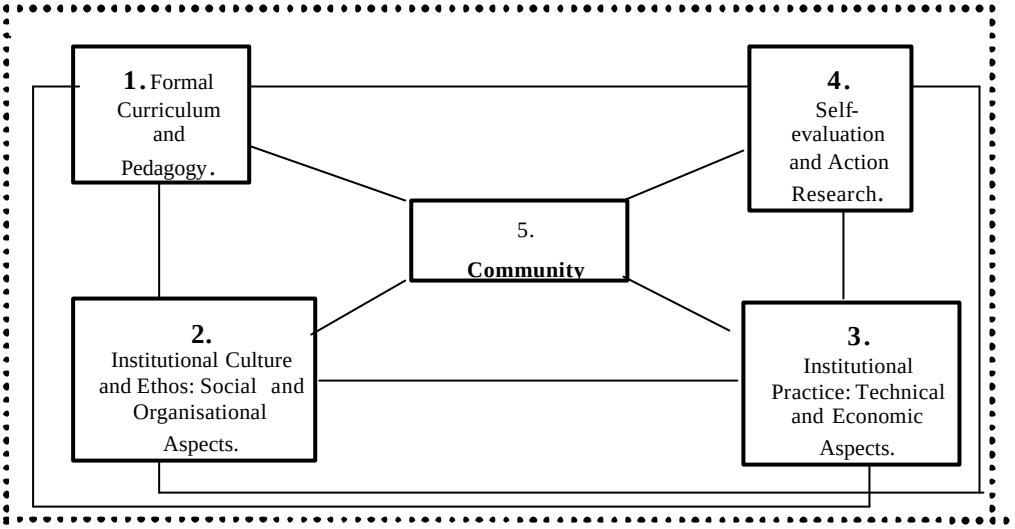
In simple terms whole schools approaches mean practising what we teach by trying to minimise the gaps between espoused values and values in action (Posch 1993) through the integration of the formal and nonformal curricula. It is education as a way of life which must be immediately and fully satisfying. In discussing the ecologisation of schools project in Austria, Posch describes whole school approaches as: '…. shaping our interaction with the environment in an intellectual, material, spatial, social and emotional sense to achieve a lasting/sustainable quality of life for all' (Posch, 1999, p.341-2). Whole school approaches integrate pedagogy, with the social/organisational and technical/economic aspects of school practice (Posch, 1999). Orr (1994) argues that an ecological education has to transform; how education institutions work, educational buildings, the substance and processes of the formal curriculum and the purposes of learning. But all these prescriptions omit evaluation and research which are integral to

whole school formulations and when added, complete a plan, do, review cycle in ESD (Rauch, 2000) see Figure 1.

> Many relevant attitudes and values will be expressed in the ethos and daily practices of the school, in the literature that it directs people to, in the versions of life that it holds up as being successful and the status it accords to different activities and relationships. These will need to be carefully evaluated from the perspective of sustainability if damaging inconsistency of message and pupil cynicism are to be avoided (Bonnet, 1999, p.323).

Many operational responses to ESD are legitimate in the wide variety of educational and environmental contexts that constitute the UK. But whatever the response, implementing a whole school approach requires the monitoring of both curricular and institutional practices in schools. Are these in current thinking and within the resources available the best solutions? Is the curriculum providing the knowledge that pupils need to live sustainable lifestyles? Can the school act as a research base to find out about social and ecological justice in the school and its local community? And perhaps most importantly of all is the school acting appropriately on this knowledge base? Whole school approaches, as conceived here, are rooted in the perspective of education as process mediated through locally derived and decided product, rather than vice versa.

Figure 1: The Five Strands of a Whole School Approachto ESD.



ESD has to counter the modernist tendency of education to become a great homogenizing force which undermines local knowledge, indigenous languages and the self-confidence of placed people (Orr, 1994). Modernist modes of thought are increasingly abstract and universal but place is specific. But the problem is that the idea of the local becomes increasingly problematic in an increasingly interdependent socio-economic world. We know that the natural world is interdependent and the modernist socio-economic enterprise constantly remind us of our powerlessness to resist the inexorable process of globalisation. In ecological terms all we appear to be able to do is to adapt to the global economic order or perish. Sustainability on the other hand implies appropriate scale in social institutions and holistic experimentation. Given media power, the culturally transforming nature of computers and world population growth there is a need to learn about local alternatives to consumerism (Bowers, 2001).The radical environmentalist solution is rooted in the concept of bioregionalism (Cheney, 1989) and the social, spiritual and ecological specificity of place. Thus the only generalisation we can make about ESD is its location in process rather than product, because the latter will be locally derived.

Besides integrating the five strands of action shown in Figure 1, ESD has implications for practice in each of these five areas. ESD will not work without the formal curriculum (Beane & Apple, 1999). The imperative is that what is learned in formal education, and more importantly how this is learned, become more central concerns of the radical environmental movement. In order to do this we have to alter the culture of modernism by adopting critical pedagogical processes in ESD which address structural, institutional and personal issues and solutions to the environmental crisis in culturally sensitive fashions. ESD is also concerned with the communal as well as the structural, personal

and institutional. Many children's' first contact with school is significant for it may be the first time that **all** of them experience community:

> Understanding and learning how to participate in these community networks is the first step to breaking out of the cycle of environmental exploitation and consumerism that creates a phenomenon not known in the natural world: waste materials that are not part of the metabolic energy exchange vital to all living entities (Stables, 2001, p.149).

Thus through whole school approaches moral education, in both its social and ecological contexts, commences at an early age (Coles, 1997, Farrer with Hawks, 2000). This is an early childhood education rooted in democracy, cooperative relationship between municipality, community, teachers and parents. The pedagogical emphasis is on talking which enables pupils to construct their own meaning and develop a sense of identity through social interaction. The curriculum is not prescribed or delivered. Pupils learn at a very early age to respect one another, to cooperate and work with one another, to listen and discuss with one another all attributes that are essential to a true working democracy (Brain, 2001). School as this place of introduction to community is also a good venue for discussing love, awe, and mystery, the relationships between emotion and intellect and perhaps caveats about the responsibilities that go with knowledge (Orr, 1994).

But it is important that such initiatives do not negate themselves because of the practices enshrined in the nonformal curriculum: 'Restoring the ideals of civic virtue and responsibility is possible only in face-to-face communities that eliminate hierarchical institutions' (Zimmerman, 1994, p 154). Whole school approaches to ESD are not just structural or process responses, they need to be founded on values. There is a great need to recognise spiritual sustainability in addition to socio-economic, political and ecological sustainability. Capra's (1996) web of life does not just involve changing from a modernist to a postmodern epistemology; it has to extend to connective, holistic approaches to the practical web of integrative experience in schools. What is vital however, is how whole school approaches and the principles and values upon which these are based are arrived at. Most changes in schools occur without the reflection and participation of pupils. These changes are either non-participatory (Table 2) or at best examples of assigned but informed participation. If change addresses citizenship, it is usually a passive rather than active formulation of citizenship when judged from pupils' perspectives.

Table 2: Ladder of Participation. (Hart, 1997).

No.	Level.	
1	Child initiated, shared decisions with adults.	Degrees of Participation.
2	Child initiated and directed.	
3	Adult initiated shared decisions with children.	
4	Consulted and informed.	
5	Assigned but informed.	Non –

6	Tokenism.	participation
7	Decoration.	
8	Manipulation.	

In schools with no formal school council, few pupils have any idea that things could be different, that there could be ways of learning to be a citizen of the school and eventually of the community, no pupils mention meetings or assemblies that could act as a forum for pupil expression which might lead to change (Davies, 1999). Active citizenship has to be critical of the status quo (Lawton et al., 2000), it has to address action and the future: 'With action competence environmental education must have a goal related to citizenship. As such it must be carried out with the simultaneous training of children as future citizens' (Uzzell, 1999, p.402). What is revealing is that Uzzell does not appear to consider children as present citizens. But schools councils may contribute to the socialisation of hypocrisy and the dilution of children's rights as present citizens if, as is true in many cases, they operate with a prescribed remit which is limited to institutional practice and become a forum for damage limitation channelling pupils' criticisms and a reactive way:

> These are areas that school management teams feel are safe for pupils to debate, while wider issues such as teacher-pupil relationships, curriculum content and delivery or issues of sexual or racial harassment are rarely discussed (Holden, 1998, p.56).

Councils work best if they are part of whole school democratic practice part of an approach that needs to be embedded at the classroom level, institutional level and through community involvement as the interface between local, national and international communities (Holden, 1998). Democracy should extend to all facets of Figure 1 by giving pupils both voice and influence in the content and pedagogy of the curriculum, by pupils interviewing prospective teachers and mediating playground disputes, recommending and implementing institutional practices such as energy conservation and by becoming researchers and evaluators in their own schools. At the moment such examples of effective school councils comes from primary rather than secondary education.

Part of a whole school approach to ESD is to educate pupils and teachers in participation at the higher levels shown in Table 2. Participation is a right endorsed in the 1989 UN Convention on the Rights of the Child (Holden & Clough, 1998, Osler, 1998). However the UN Convention only requires that adults establish what children's views are, it does not requires that children are actually involved in decision making (Spier, 2000), the higher levels of participation in Table 2. Thus the concept of children's participation is problematic. For example children are concerned about the future in relation to social and ecological justice and wish to act to promote positive change, but lack a clear vision of their own part in this process (Hicks & Holden, 1995). Spier (2000) argues for a five stage model of children's participation. At the first stage children are listened to, at the second they are supported in expressing their views, at the third their views are taken into account, at the fourth they are involved in making decisions and at the final stage they

share the power and responsibility for decision making with adults. Each stages operates at three levels; firstly personal commitment, secondly, meeting the needs that ensure that the individual or organisation can operate at the appropriate stage and finally agreed institutional policy. Spier's model does not cater for a stage of independent decision making by children as it is only concerned with stages of participation which occur as a result of interactions between adults and children. A more serious problem is that Spier does not require a fourth level of action within each stage and thus leaves open the not unusual possibility that policies, as espoused values may not be reflected in institutional action. Policy does not mean practice. Thus HE has to recognise not only tat it can learn from teachers but also that it has to revise its ideology of children from one of regarding them as citizens in waiting to an ideology which sees children as present citizens.

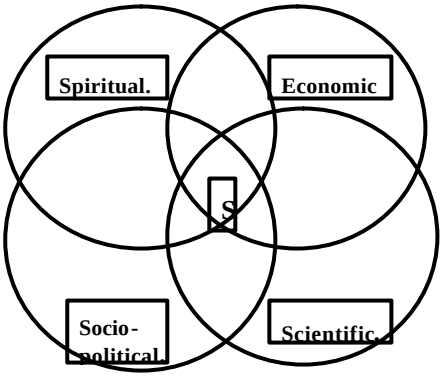
What is clear is that some schools are generally well ahead of HE in practising such a participative, holistic, process based view of ESD. For example where universities address the institutional practice agenda this is often through committees which are only representative of those who work in the organisation. HE had much to learn about learning from its students, making connections with its local communities and developing synergistic approaches which will see them become learning as well as teaching organisations.

The Deep Question.

How do we get from the dominant social, educational paradigm grounded, at best, in shallow reformist environmental ethics and disciplinary epistemologies to a transformatory social and educational paradigm founded on deep green ecocentric ethics, environmental justice and holistic, integrated epistemology? In short how do we realise ecocentric, whole school approaches?

There are two major prerequisites for a theory of action for ESD. Firstly, recognising and removing barriers, particularly those internal to ESD, which have already been discussed. Other problems for ESD are its association, with the scientific-ecological sphere of sustainability (Figure 2). Secondly, recognising the ramifications of conflating philosophical and psychological perspectives on change by neglecting the differences in the directions in which a philosophically developed theory of ethics and a pragmatically focused theory of action usually proceed (Figure 3).

Figure 2: The Four Domains of Sustainability.



Journey Rather Than Destination: A Theory of Action in ESD.

There are differing environmental philosophies from which educational provision can be derived, such as deep ecology, social ecology, socially critical perspectives or ecofeminism. While social ecology, socially critical perspectives and ecofeminism's claims to ecocentricity are dubious because of their fundamentally social and therefore anthropocentric focus (Bowers, 1997), from the viewpoint of a theory of action this claim to ecocentricity can be seen, developmentally, as one of emotional intent. Thus those who pursue ESD based on any of these social philosophies will be making some contribution to one of the four spheres of sustainability in Figure 2. Psychologically, socially critical education, social ecology and ecofeminism, represent structuralist, arguably more amenable starting points to transformation because they are rooted in critiques of the dominant Western social paradigm that rarely invoke personal responsibility or guilt. This pragmatic, developmental argument gains strength from the apparently broad agreement among deep ecologists, social ecologists and socially critical schools of thought about transformatory, process focused, whole institution approaches to ESD (Orr, 1994, 1996, Sterling 2001). Thus if a theory of action concerns itself with how education is enacted in schools at the level of concrete decisions and actions, (Figure 3) the prospect of greater agreement about the prognosis for ESD appears rosier: 'They concur with the practice even though they operate from diverging theories' (Naess, 1995a, p.66).

Figure 3: The Four Levels of Deep Ecology (modified from Naess, 1995b)

PLEASE SEE AUTHOR

This is not a search for tyrannical consensus, but for the appreciation that perspectives that appear contested when viewed from a philosophical perspective, can, when viewed from the perspective of agency and praxis be seen more as inclusive, constructive, developmental contributions to a theory of action. Such essentialist positions have the potential to fragment the contribution of the radical environmental movement to formal education's provision for sustainability by marginalising other radical viewpoints. Furthermore it is easier to cater for cosmological and ethical identification with ecocentric stances in formal education than it is to provide for more serendipitously realised ontological identification.

The same argument can also be applied to conceptions of ESD. Uzzell et al. (1994) and Elliot (1999) argue that authentic EE is rooted in experience of the world outside school But regarding experience external to the school as the sine qua non of authentic EE has adverse consequences. The danger is that in setting community links as the authentic outcome for all EE programmes from the outset may lead schools to involve themselves initially in over-ambitious projects which lead to debilitating stultification rather than facilitating progress. While the view of school as both ecological and social community linked with their local community through local action fields represents one of the most effective ways that school children can have influence and be influenced as global citizens, such spatial prescriptions partly miss the point.

The processes through which individual, school and community actions emerge and the impact of these processes on pupils and other members of schools and their wider communities, as individual and social agents promoting change, are the critical features of being and becoming a global citizen. For practical reasons it is important that such a process-oriented initiative is located within a locally coherent theory of action, especially for primary school pupils. But community involvement should not be regarded as the essence of ESD, but as one of many possible co-ordinates on a quest in which the journey is more important than the destination. Thus a school with a highly developed, internally focused, democratic, participatory culture could be considered to have a more developed ESD than a school with high levels of community linkage achieved through much lower levels of democracy, collaboration and participation. Although the absence of community links would represent a gap between a school's current practices and our ultimate vision of ESD, it is an ideal that may never be realised. Ideals are elusive for at least two reasons. Firstly: '…as soon as we approach the ideal, the ideal changes. Engaging reality with the will to transform it opens up a new realm of possibilities' (Chodorkoff, 1990, p.74). Secondly, ideals themselves are very contentious in education (Reisman, 1990). From a postmodern perspective, ideals located in product are anathema because of their universalising utopianism. However, Fullan (1991), who regards vision as a feature of change that comes later and premature visions as potentially blinding, does acknowledge the importance of generic, process based vision:

> If there is one justifiable vision that is generic to our argument, it is a vision of particular ways of working together and of commitment to perpetual learning and improvement. …. process visions about how schools work together are central to continuing improvement (Fullan & Hargreaves, 1992, p.122).

A theory of action in ESD starts by considering the processes needed to instigate concrete decisions and actions, level four in Figure 3. Not only does this theory of action begin with the day to day realities that educators experience, it is often easier, in a local context, to reach agreement about what the right educational processes are and what constitutes sound environmental action than what constitutes a sound environmental ideology. Thus focusing on processes generically and outcomes locally offers the prospect of greater agreement. To paraphrase Schumacher we need to stop asking whether we will get there or not, or which is the correct route and get down to work (Orr, 1996). In this spirit of collaborative action Posch (1999) identifies five outcomes of a theory of action. Firstly, to win critical mass through persuasion, good example and open communication. Secondly, to create the conditions which allow passive concerns to be turned into active involvement for parents and pupils. Thirdly to develop an organisational structure which ensures the quality and suitability of ESD. Fourthly, to pool existing initiatives to obtain synergy and finally to create mutual expectations and traditions with respect to appropriate attitudes and actions. But despite his cultural focus, Posch (1999) does not indicate how such process-focused outcomes might be realised.

To propose a theory of action that derives educational practice from the theoretical base of deep green ethical values would represent a major transformation in procedures and perceptions for most teachers. To many teachers such a transformation would appear difficult, (McCluney, 1994), if not impossible, and therefore psychologically disempowering (Roszak, 1995) for a coherent theory of action:

> Call someone's entire way of life into question, and what you are apt to produce is defensive rigidity. It is elementary psychology that those who wish to change the world for the better should not begin by vilifying the public they seek to persuade, or by confronting it with a task that appears impossible, (Roszak, 1995, p.16).

Environmental action should initially address win-win situations so a theory of action must recognise the need for organisational analysis (Argyris & Schon. 1996) through a survey of existing, practices, conditions and values. In the context of transformatory change to ESD, surveying should adopt qualitative, ethnographic action research strategies to illuminate the educational and environmental aspirations of staff, it cannot rely solely on the objectivist, empiricist strategies associated with the modernist accommodatory or reformatory approaches to change implicit in Hargreaves and Hopkins' (1991) school effectiveness agenda. However, in the early stages of a theory of action it will be necessary to adopt pluralist action research strategies that use quantitative and qualitative methods. Such an approach will demonstrate that process focused ESD is capable of meeting modernist criteria of what constitutes effective

education while contemporaneously posing deep questions about the nature, purpose and ultimate values of an education that will contribute to the transformation of lifestyles needed to identify and realise sustainability. By taking a perspective which includes action, participation, action competence and local democracy, a radicalised, pluralist, critical approach to surveying will strengthen the knowledge, insight and commitment of teachers and pupils while disseminating ideas and experiences to non-participants in the endeavour (Uzzell et al., 1994).

One way to a sustainable future is through appealing to short-term economic self-interest. Another route to sustainability is through virtue. Orr (1994) considers this distinction between self-interest and virtue to be a false dichotomy as a theory of action it is about both, and virtue is founded on the bedrock of community; on the intellectual foundation of communicative rationality (Habermas, 1996):
'The context of interaction is in some degree shaped and organised as an integral part of that interaction as a communicative encounter' (Giddens, 1979, p.83). But the convergence of virtue and self-interest may not occur as often we might like. From the perspective of a pragmatic theory, action could start with short-term, economically focused win-win actions. Philosophy is about action as well as theorising. In trying new practices we should be selective and small scale (Evans, 1993): 'Because success calls for a sustained effort over a long time, proximal subgoals are needed to provide incentives and evidence of progress along the way' (Bandura, 1986, p.453).

Another reason for stressing economic self-interest as a potential starting point for a theory of action is because as long as mental-egoic consciousness is prevalent, reform environmentalism will be dominant (Zimmerman, 1994). ESD is currently at a stage of putative genesis and we can only have the barest idea of what ethics beyond anthropocentrism will look like. Therefore we should privilege the processes that will help the change from anthropocentric to ecocentric ethics through transforming communicative rationality, while acknowledging that the processes that link culture and ethics weave a complex web. This is not an argument for privileging ethics above ontology or cosmology, but recognising that ethics will probably come first in the evolution of the social processes which will eventually lead to ontological identification. 'It is a long-term process of deploying resources not to directly achieve an end, but to establish a situation in wh ich those ends are more likely to be achieved (Begg, 2000, p257). Reform environmentalism will be here for a long time and a theory of action for ESD has to recognise this:

> But right now the Deep Green's perspective is so much at variance with the main thrust of modern culture that it would take a long time for it to make a serious difference (Harper, 2001, p.27)

So the first philosophical step towards nondualistic consciousness for a theory of action for ESD is the development and implementation of a mo dernist, liberal, democratic humanism (Wilber 1983) in which the majority will become responsible people. Thus a theory of action should promote steps that are intermediate between mental-egoic and nondualistic consciousness, while also acknowledging that humanity may well destroy

itself before nondualistic consciousness is realised. Making links with earlier levels of consciousness and the contemporaneous evolution of values and social structures is good practice within a theory of action; otherwise revolution may very well subvert transformation.

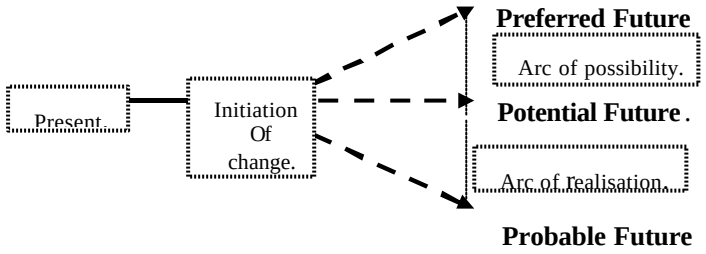
A praxis between the intellectual theorising that provides a rigorous philosophical foundation for ecocentricity and the practical action which applies ecocentric ideas in a fashion sensitive to and constructed in local contexts has to be ESD's aim and could also attract widespread support from teachers if it is approached through the latter. Initially the intellectual appeal of a theory of action could be to extension of anthropocentrism, with which most teachers currently identify, towards weak anthropocentrism (Sosa, 1996) before grasping serendipitous opportunities to critique anthropocentricity to reveal and develop ecocentric consciousness. Ecocentric ethics, ontologies or cosmologies are not essential for participation in the journey towards sustainable lifestyles, though these would obviously help. A theory of action is founded on the belief that for many, ecocentric consciousness will develop on this journey as an emergent property of whole institution approaches.

A theory of action is demonstrably concerned with the future and as such has to make the distinction between preferable and probable futures (Hicks, 2001); respectively the future we want to see and the future we expect to see. However in the context of ESD it can be argued that there is a third conception, the potential future (Figure 4). Continuation of the dominant social paradigm will lead to the probable future, the preferred future is the vision associated with transformatory change: '. creating a vision forces us to take a stand for a preferred future' (Block 1992 in Fullan, 1993). The potential future arises from the recognition, that within a theory of action visions, be they concrete utopias or process visions, are ultimately unattainable as ideals (Scarce, 1990, Fullan, 1991, 1993, 1999, Begg, 2000, Sterling 2001). Potential futures compromise the visionary (preferred) with the possible (potential). Potential futures acknowledge the differences between the design for a preferred future, reflected in espoused theories of action and that which is achievable through theories in use. Potential futures require the pragmatism of a theory of action. As we progress towards the preferred vision we will never reach, in so doing, we will recognise that no social movement is ever completely successful in accomplishing its goals or in winning everyone's support (Scarce, 1990). The more effective the theory of action the shorter the arc of possibility between preferred and potential futures and the longer the arc of realisation between probable and potential futures in Figure 4.

Transformation that lengthens the arc of realisation and shortens the arc of possibility is more likely to be achieved by translating subversive complicity into developmental strategies within schools not through external confrontation. Thus initially ESD should validate itself against the dominant standards that constitute modernist conceptions of the good education. Within this Gramscian mode of thinking economic growth per se ceases to be the issue. The real question is, can those attributes of education, which governments use as indicators of the effectiveness with which education addresses the economic growth agenda, be delivered through ESD focused on transformative school development that contributes to achieving social and environmental justice? An interesting strategy,

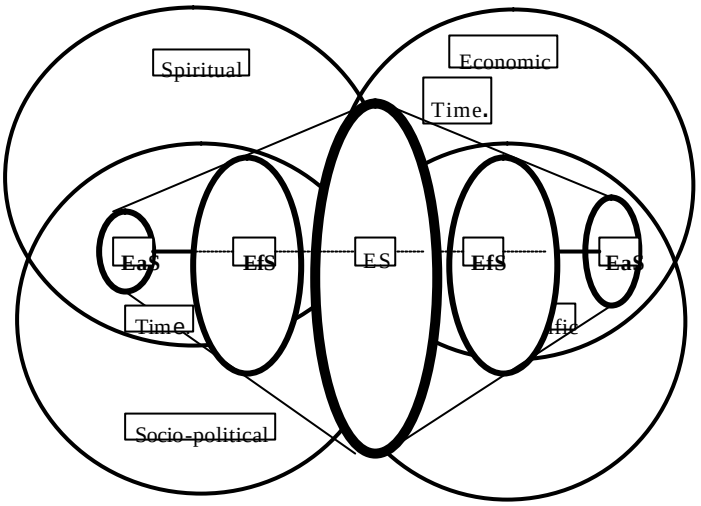
given the UK government's profound interest in developing social capital, as part of the Third Way, is to make the political link between ESD, citizenship and the development of social capital. The re-energising of community is a key feature of ESD and social capital theory. But engaging with social capital has to be based on subversive complicity by complying with the community focus on social capital development while subverting the authoritarian populism and economic functionalism of current Third Way thinking by insisting that ESD must address social justice through participative democracy combined with action focused critical pedagogy.

Figure 4: Probable, Preferred and Potential Futures.



In order to create the critical mass that Posch (1999) considers essential to transformatory educational change and to fill in many of the holes that proponents of ESD have dug for themselves and others, we need a more inclusive view of ESD. This should be a view that does not reject cognitive education about sustainability (EaS) and values focused education for sustainability (EfS) but recognises these as evolutionary developments as schools proceed towards ESD (Figure 5). The intersection of the four spheres in whole school approaches remains the preferred future for ESD (Figure 5), though individual schools might be working with more restricted visions in their short-term theories of action. This model is mapped in Figure 5. At the design stage of a programme of action for ESD, schools would map their existing provision in the three dimensional matrix shown in Figure 5 as the four spheres of sustainability feature at all three levels, EaS, EfS and ESD. If a school's current causation and dependence produce an educational provision that is mainly cognitive and ecological in focus then this school's provision lies in the ecological sphere at the EaS level. Even schools which did not describe their provision in ESD or EE terms would find aspects of their practice lying in at least one of the four spheres at the EaS level if they applied principles of sustainability, such as the principles of sustainable living (Fien, 1993) or the princip les of a sustainable society (IUCN, 1991) to their curriculum. The critical question is not whether current educational provision is at the level of accommodatory or even reformatory change, but whether those designing change in schools see process based ESD, which integrates the cognitive, affective and active as their vision, rather than EaS which is focused only on cognitive product.

Figure 5: A Theory of Action for Action Leading to Sustainability Education.

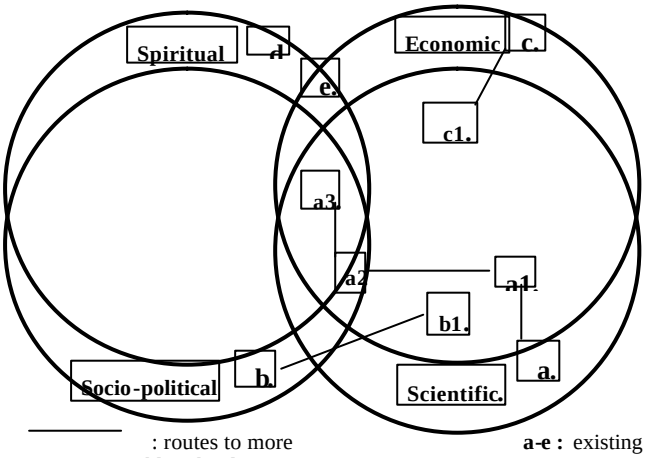


Having established that education is operating at the EaS level the next question would be what are the school's rationale, vision and design for future change? There is no single correct answer here as this decision will depend on information revealed by survey, particularly that relating to the environmental aspirations of staff, the change agent's understanding of local context, other pressures upon the school for change and other issues covered earlier in the discussion of surveying. For example for many schools in the UK the ideologies of staff are likely to be strongly anthropocentric and the external context of OFSTED inspection and league tables is likely to put significant pressure on schools to improve standards of cognitive achievement through improved SAT scores. In this situation the decision of the school may be to extend EaS into the other spheres of sustainability as a way of advancing the school curriculum towards cognitive holism. Figure 6 shows an example of such an approach. Position **a** shows a school that has identified its current approach as EaS mainly taught through ecology. The theory of action for this school might then set **a1** as its next most proximal goal, by including some issues related to global or national inequality in its formal curriculum. The move to **a2** could be achieved through aspects of anti-racist, multicultural education. The last step, at the EaS level, might be to incorporate some discussions of the moral and/or religious issues raised by environmental justice in the curriculum: **a3**. This theory of action could be justified to teachers and school governors as a strategy for addressing citizenship and cross-curricularity in the school curriculum. Subsequently the school might develop strategies to introduce EfS by addressing emotional intelligence while recognising that its preferred future would be ESD rooted in collaboration, participation, democratic education, critical pedagogy and community development. Figure 6 shows other routes and initial positions which should be self-explanatory.

The theory of action outlined in Figures 4 and 5 is flexible. It could also accommodate differing perspectives on ESD such as social ecology, socially critical approaches and

ecofeminism as well as more reformist stances as its levels. From the perspective of deep ecology the other three perspectives would be perceived as intermediate to realising ESD, rather than competing visions of ESD. The contention is that deep ecology is the only radical environmental perspective that is grounded in ecocentricity and the self-realisation that are crucial if ESD is to be realised; hence deep ecology's status as *primus inter pares*. But this theory of action suggests that deep ecology could also be considered as an intermediate step towards a vision of ESD if viewed from one of the other three perspectives. Establishing areas of agreement within a contested professionalism is more likely to lead to an emerging synthesis of viewpoints in the journey towards ESD. Deep ecology is no Koran, no tablet of stone, like its radical epistemological siblings it is an evolving practical and philosophical response to the environmental crisis that will continue to develop as our consciousness of what sustainability means sharpens and burgeons. In this evolution a new meta-synthetic perspective may emerge which unifies these four currently related but rather disparate viewpoints.

Figure 6: Education about Sustainability: Starting Points and Pathways.



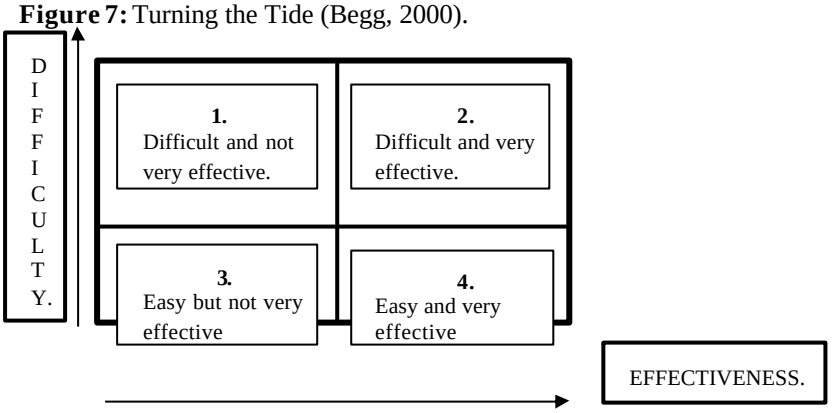
: routes to more sustainable school practice.

a-e : existing school practice.

But what analysis do we deploy to identify the proximal, win-win actions that will form the early steps on the journey to ESD? Figure 7 offers one solution to this quandary by evaluating possible actions on the basis of their difficulty and effectiveness. Boxes 1 and 2 need to be avoided in the early phases of promoting and imp lementing change. Ideally the strategy would be to start with box 4 and move towards box 2 while acknowledging that predictions of difficulty and effectiveness are simply that; predictions. In the journey towards sustainability any strategy may become more or less complex than initially predicted or more or less effective than first thought. Actions based on least cost economic principles can save money, which can be redirected from energy budgets to the purchase of teaching resources. Alternatively actions which develop more effective curriculum performance, such as more holistic, values focused pedagogy may satisfy subversive ESD requirements while remaining complicit with the demands of modernist performance oriented systems (Farrer with Hawkes, 2000). Recognising the need for a

theory of action ESD can meet the performance criteria for good modernist education while beginning to address transformation by broadening the purposes of education and presenting a more coherent rationale than that based on modernist tensions and contradictions between for example consumerism and global citizenship.

Figure 7: Turning the Tide (Begg, 2000).



Conclusion. Who Learns from Who is ESD.

If HE is to make a significant contribution to ESD it has to:

- recognise the need to practise what it teaches through synergistic whole institution approaches.
- transform its view of the academic to that of praxtitioner, a Thoreauvian view of the philosopher as both theoretician and practitioner,
- recognise that praxtitioners may be located in schools as well as HE institutions.
- transform its view of children to one of present citizens rather than citizens in waiting especially in teacher education
- appreciate that learning about ESD can come synergistically from a variety of sources including children
- contribute to the psychologising of ecophilosophy especially in recognising the difference between vision and the process of change in which journey or process is more important than Utopian vision or destination.

References.

Alderson P. (2000) Citizenship in Theory and Practice: Be ing or Becoming Citizens with Rights,
in **Lawton D. et al., (eds.)** op. cit., pp.114-35.

Argyris C. and Schon D. A. (1996) *Organizational Learning II, Theory, Method, and Practice,* Reading, Mass., Addison-Wesley.

Ball S.J. (1997) Policy Sociology and Critical Social Research: a personal review of recent education policy and policy research, *British Educational Research Journal* 23 (3), p.257-74).

Bandura A. (1986) *Social Foundations of Thought and Action: A Social Cognitive Theory,* Englewood Cliffs, Prentice Hall.

Beane J. A. and Apple M.W. (1999) The case for democratic schools, in **Apple M.W. and Beane J.A.** op. cit., pp.1-29.

Begg A. (2000) *Empowering the Earth: Strategies for Social Change,* Dartington, Green Books.

Blenkin, G. M., Edwards G., and Kelly A. V. (1992) *Change and the Curriculum,* London, Phil Chapman Publishing.

Bonnet M. (1999) Education for Sustainable Development: a coherent philosophy for environmental education, *Cambridge Journal of Education,* 29(3), p.313-24.

Bowers C.A. (1997) *The Culture of Denial, Why the Environmental Movement Needs a Strategy for Reforming Universities and Public Schools,* Albany, State University of New York Press.

Bowers C.A. (2001) How Language Limits Our Understanding of Environmental Education, *Journal of Environmental Education Research,* 7(2), pp.141-51.

Bowers C.A. (2002) Toward an Eco-justice Pedagogy, *Environmental Education Research,* 8(1), pp.21-34.

Brain J. (2001) True Learning, *Resurgence,* 204, pp.30-31.

Brennan A. (1991) Environmental Awareness and Liberal Education, *British Journal of Educational Studies,* 39(3), pp 279-295.

Capra F. (1996) *The Web of Life,* New York, Anchor Books.

Cheney J. (1989) Postmodern Environmental Ethics: Ethics as Bioregional Narrative, *Environmental Ethics,* 11(2), pp.117-34.

Chodorkoff D. (1990) Social Ecology and Community Development in **Clark J. (ed) (1990)** *Renewing The Earth. The Promise of Social Ecology,* London, Green Print, pp.69-79.

Coles R. (1997) *The Moral Intelligence of Children,* London, Bloomsbury.

Davies L. (1999) Researching democratic understanding in primary school, *Research in Education,* 61, p.39-48.

Elliot J. (1999) Sustainable Society and Environmental Education: future perspectives and demands for the education system, *Cambridge Journal of Education,* 29(3), 325-40.

Evans K. (1993) *School Based Inservice Education, case studies and guidelines for implementation***.** Culemborg, Phaedon.

Farrer F. with Hawkes N. (2000) *A Quiet Revolution: Encouraging positive values in our children,* London, Rider.

Fien J. (1993) *Environmental Education* (after IUCN, UNEP, WWF 1991) Nathan, Griffith University Press.

Fien J (1995) Towards Critical Curriculum Theorising, in **Jensen B.B. (ed.)** op. cit., pp.

Foster J. (2002) Sustainability, Higher Education and the Learning Society, *Environmental Education Research,* 8(1), pp.35-41.

Freeman C. (1999) Children's participation in environmental decision making, in **Buckingham-Hatfield S. and Percy S.** *Constructing Local Environmental Agendas: People places and participation,* London, Routledge, pp.68-80.

Freire P. (1972) *Pedagogy of the Oppressed,* Penguin Books, Harmondsworth.

Fullan M. (1991) *The New Meaning of Educational Change,* London, Cassell.

Fullan M. (1993) *Change Forces. Probing the Depths of Educational Reform,* London, Falmer Press.

Fullan M. (1999) *Change Forces; the Sequel,* London, Falmer Press.

Fullan M. and Hargreaves A. (1992) *What's Worth Fighting for in Your School?* Buckingham, Open University Press.

Giddens A. (1979) *Central Problems in Social Theory Action, Structure and Contradiction in Social Analysis,* London, Macmillan.

Gough S. (2002) Increasing the Value of the Environment: a 'real options' metaphor for learning, *Environmental Education Research,* 8(1), pp.61-72.

Greig S., Pike G. and Selby D., (1989) *Greenprints For Changing Schools,* London, WWF & Kogan Page.

Habermas J. (1996) An Alternative Way out of the Philosophy of the Subject: Communicative versus Subject-Centred Reason, in **Cahoone L. E. (ed.)** *From Modernism to Postmodernism: An Anthology,* Oxford, Blackwell.pp.589-616.

Hargreaves, D. and Hopkins, D. (1991) *The Empowered School,* London, Cassell.

Harper P. (2001) Striking The Balance, *Resurgence,* 208, pp.27-7.

Hart R., (1997) *Children's Participation. The Theory and Practice of Involving Young Citizens in Community Development and Environmental Care,* London, UNICEF/Earthscan.

Hewton E., (1988), *School Focussed Staff Development Guidelines for Policy Makers,* Lewes, Falmer Press.

Hicks D. (2001) *Citizenship for the Future: A Practical Classroom Guide,* Godalming, WWF-UK.

Hicks D. and Holden C. (1995) *Visions of the Future: Why We Need to Teach for Tomorrow,* Trentham, Stoke on Trent.
Holden C. (1998) Keen at 11, Cynical at 18? Encouraging Pupil Participation in School and Community, in **Holden C. and Clough N. (eds.)** op. cit., pp.46-62.
Holden C. and Clough N. (eds.) *Children as Citizens: Education for Participation,* London, Jessica Kingsley,
IUCN, UNEP, WWF. (1991) *Caring for the Earth: a Strategy for Sustainable Living,* Geneva, IUCN

Jensen B. B. (ed.) (1995) Concepts and Models in a Democratic Health Education, *Research in Environmental and Health Education,* Copenhagen, Royal Danish School of Educational Studies,

Jickling B. (1999) Beyond Sustainability: Should We Expect More From Education? Grahamstown, *Conference of the Environmental Education Association of South Africa.*

Jickling B. (2001) Environmental' Thought, the Language of Sustainability, and Digital Watches, *Environmental Education Research,* 7(2). Pp.167-80.

Lawton D. Cairns J. and Gardner R. (2000) *Education for Citizenship,* London, Continuum.

MacIntyre A. (1996) The Virtues, the Unity of a Human Life and the Concept of a Tradition, in **Cahoone L (ed.)** op. cit., pp.534-55.

McCluney R. (1994) Sustainable Values in **Brown N.J. & Quiblier P., (eds)** *Ethics and Agenda 21: Moral Implications of a Global Consensus,* New York, United Nations Environment Programme,
pp. 13-26.

Naess A. (1995a) The Deep Ecology Movement Some Philosophical Aspects, **in Sessions G. (ed)** *Deep Ecology for the 21st. Century,* Boston, Shambhala Publications, pp.64-84.

Naess A. (1995b) The Apron Diagram, **in Drengson A. and Inoue Y. (eds.)** *The Deep Ecology Movement: An Introductory Anthology,* Berkley North Atlantic Books., pp.11-12.

Orr D.W. (1994) *Earth in Mind On Education, Environment, and the Human Prospect,* Washington DC, Island Press.

Orr D.W (1996) Slow Knowledge, *Resurgence,* 196, pp 30-32.

Osler A. (1998) Conflict, Controversy and Caring: Young People's Attitiudes towards Human Rights in **Holden C. and Clough N.** op. cit., pp. 113-26.

Paden R., (1994) Against Grand Theory in Environmental Ethics, *Environmental Values,* 3, pp. 61-70.

Posch P. (1993) Approaches to Values in Environmental Education in **OECD/ENSI** *Values in Environmental Education, Conference Report,* SCCC, Dundee, pp.27-35.

Posch P. (1999) The Ecologisation of Schools and its Implications for Educational Policy, *Cambridge Journal of Education,* 29 (3), pp.341-48.

Quigley P. (1992) Rethinking Resistance: Environmentalism, Literature and Poststructural Theory, *Environmental Ethics,* 14(4), pp.291-306.

Rauch F. (2000) Schools: a place of ecological learning, *Environmental Education Research,* 6(3), p.245-56.

Reisman D. (1990) *Theories of Collective Action Downs, Olson and Hirsch* , Basingstoke, Macmillan.

Roszak T. (1995) Where Psyche Meets Gaia, in **Roszak T. Gomes M. E. and Kanner A. D.** *Ecopsychology Restoring the Earth Healing the Mind* , San Francisco, Sierra Club Books, pp. 1-17.

Scarce R. with Brower D. (1990) *Eco-Warriors Understanding the Radical Environmental Movement,* Chicago. The Noble Press.

Shallcross T. and Wilkinson G. (1998) The Primacy of Action: the Basis of Initial Teacher Education for Sustainability, *International Journal of Environmental Education,* 17(3) pp.243-56.

Sosa N.M (1996) The Ethics of Dialogue and the Environment Solidarity as a Foundation for Environmental Ethics, in **Callicott J.B. and da Rocha F.J.R. (eds.)** *Earth Summit Ethics Towards a Reconstructive Postmodern Philosophy of Environmental Education,* Albany, State University of New York Press, pp.47-70.

Spier H. (2001) Pathways to Participation: Openings, Opportunities and Obligations: A New Model for Enhancing Children's Participation in Decision-making, in line with Article 12.1 of the United Nations Convention on the Rights of the Child, *Children and Society,* 15, pp.107-17.

Stables A. (2001) Language and Meaning in Environmental Education: an overview, *Environmental Education Research,* 7(2), pp.121-28.

Stables A. and Scott W. (2002) The Quest for Holism in Education for Sustainable Development, *Environmental Education Research,* 8(1), pp.53-61.

Sterling S. (2001) *Sustainable Education Revisioning Learning and Change*, Dartington, Green Books.

Thoreau H. D. (1996) *Walden,* Cologne, Konemann.

Titman W. (1994) *Special Places; Special People,* Godalming, World Wide Fund for Nature and the Learning Through Landscapes Trust.

UNESCO (1978) *Intergovernmental Conference on Environmental Education,* Tbilisi, UNESCO.

UNESCO (1997) *Educating for a Sustainable Future A Transdisciplinary Vision for Concerted Action*, Paris, UNESCO.

Uzzell D. Davallon J. Fontes P. J. Gottesdiener H. Jensen B.B. Kofoed J. Uhrenholdt G. Vognsen C., (1994) *Children as Catalysts of Environmental Change*, Brussels, European Commission Directorate General for Science Research and Development.

Uzzell D. (1999) Education for Environmental Action in the Community: new roles and relationships, *Cambridge Journal of Education,* 29(33), p.397-414.

Vognsen C. (1995) The QUARK programme, a Collaboration on Development of Environmental Education and Ecological technologies in Local Communities., in **Jensen, B.B. (ed)** op. cit.

Wilber K. (1983) *Up From Eden: A Transpersonal View of Human Evolution,* Boulder, Shambhala.

Zimmerman M. E. (1994) *Contesting Earth's Future: Radical Ecology and Postmodernity* Berkeley, University of California Press.

Return to Contents

36. Approaching the Issue of Teaching for Sustainable Development at the University of Aegean, Greece

Constantina Skanavis, Ph.D.

University of Aegean, Mytilini-Greece

Constantina Skanavis, Ph.D.
Associate Professor in Environmental Education and Communication,
Department of Environmental Studies,
University of Aegean, Mytilini-Greece
Address: Xenia building, 81100 Mytilini, Greece
Tel/fax: (+30) 251036234
e-mail**: cskanav@aegean.gr**

Abstract
It has been well recognized that the ultimate goal of the environmental education movement is to reach all citizens and assist them in the development of environmental knowledge and awareness. This way people will actively participate in the protection and restoration of the environment as well as in the decision-making environmental processes. The available formal, non-formal and informal educational techniques have been reviewed and accordingly utilized at the different settings which have resulted in a respectable volume of publications. At the University of Aegean the responsibility of Environmental Education and Communication has been placed in the department of Environmental Studies. In order to carry out this delicate task an Environmental Education and Communication Laboratory has been established with the purpose to initiate, direct and monitor the environmental education efforts as well as disseminate information to the campus community. A recent project has focused in the assessment and evaluation of the university teaching for sustainable development. An extensive literature search has revealed several innovative methodologies and campus needs. Sensitivity models have been utilized in order to assess the environmental awareness and sensitivity of university students. The accumulated data and information have been analyzed and suggested procedures have been outlined. The focus of this chapter is to present the existing status of teaching for sustainable development in Greek universities and the aims are to cover all related bibliography, analyze methodologies used and outline the environmental education strategic planning at the University of Aegean.

Keywords: Communication, Higher Education, Environmental Education, Environmental Studies

Background Information:

Academic institutions face the challenge to demonstrate the interconnection of Environmental Education (EE) to economic, social and technological issues and related environmental solutions. Prevention is by far more desirable than enforcement or remediation, and EE is the best possible approach for preventing environmental problems and achieving a sustainable society. EE is important because it helps people understand how their actions and choices affect the environment and how they can contribute to the preservation of both environmental and life quality. EE is of vital importance all over Earth today. Increasingly complex and widespread environmental problems demand a knowledgeable, motivated, active citizenry and competent professionals to help enhance and preserve environmental quality.

Furthermore, the link between environmental challenges and human health is a major cause for public concern about the environment. EE helps prevent or mitigate environmental health problems by providing the public with information on how individuals and collective actions lead to environmental pollution, how pollutants may affect one's health, how to assess environmental health risks and how to respond to environmental threats. The ultimate goal is the achievement and homeostasis between quality of life and quality of the environment.

Education for sustainability provides the awareness, knowledge, critical-thinking and problem-solving skills to be able to identify and formulate problems, to make intelligent environmental decisions, reinforce environmental values that motivate attitudes and hopefully teaching for sustainable development cultivates a positive environmental behavior (Kelley-Laine, 1997). The goal of EE is to build these skills that will in return enable individuals to actively participate in the environmental decision making. Emphasis should be placed on developing abilities that will facilitate the critical thinking process and will persuade participants to think globally but act locally (Mann and Stapp, 1982 & Stokes, 1981).

Changes cannot take place in one planet of the complex web of life without affecting the whole. Every proposed human change in the environment must be considered for its total effects. Ignorance of the long-term indirect consequences of human activities is the root of the contemporary crisis (President's Council on Recreation and Natural Beauty, 1969). Therefore EE can help in the creation of an informed and committed citizenry that understands the connection between a healthy environment and a quality life and has the skills, expertise, and commitment needed to make informed decisions and participate in the democratic resolution of environmental problems.

History of the Evolution of Sustainable Development Education:

The EE movement was launched in the 60s and it has been increasingly gaining support. Organizations and movements are formed, action groups are established, and people have become progressively aware of what the environment is, its current condition and the way it should be. Officially, the EE was an idea that gained a lot of attention in international Symposia like the 1970 Nevada Workshop, where EE was defined as the process, which leads to the development of abilities and attitudes necessary to make people comprehend and appreciate the relationship between them, their culture and the biophysical environment. Also, it is linked to the decision making process and the formation of a behavioral code towards issues of environmental quality (Palmer, 1998).

The Stockholm conference, in 1972, acknowledged the need of the EE as the solution to the environmental degradation. UNEP (United Nations Environmental Programme) was established in 1972 and along with UNESCO they set up the Belgrade Conference in 1975. According to the "The Belgrade Charter", the Environmental Education aims are: awareness (of environmental problems), knowledge (of the role of humans in the environment and of the responsibilities towards it), attitude (to the environment, which should be active and protective), abilities (to solve the environmental problems), assessment capabilities (of the measures taken and the educational programmes suggested) and participation (of the social groups in the solution of the environmental problems) (UNESCO-UNEP, 1976). Other UNESCO-UNEP EE Conferences were the Tbilisi "Intergovernmental Conference on EE" in 1977, a landmark in the history of the EE, where everything was explicitly defined. Targets, criteria, and issues of the EE were analyzed and the policy to be followed was discussed. It was highlighted that development in technology and economy is not the source of the problem; on the contrary it is essential, particularly for third world countries. Its direction and implementation are the issues to be addressed, since they have to be of a nature that respects the environment (UNESCO, 1978).

The notions of the balanced development, equity and social cohesion were from the very beginning integral parts of the foundations of environmental educations, as one could see from the Belgrade Charter (1975) and the Tbilisi (1977) Conference. Furthermore, the Congress on Environmental Education and Training in Moscow in 1987 (UNESCO, 1987) raised also the promotion of peace as a central objective of the EE.

Agenda 21, adopted by the 1992 Earth Summit, emphasizes that human population, consumption, and technology are the primary driving forces of environmental change. Steps are outlined in order to reduce wasteful and inefficient consumption patterns in some parts of the world while encouraging increased but sustainable development of others. Agenda 21 states that "education is critical for promoting sustainable development and improving the capacity of all people to address environmental and development issues" (UNCED, 1992).

The Conference on 'Environment and Society: Education and Public Awareness for Sustainability' was jointly organized by UNESCO and the Greek Government with the coordination of Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE) and the University of Athens in 1997. More than 1400 participants from 84 Countries met and discussed about EE, endorsing the Thessaloniki Declaration, where the Education for the Environment is proposed as the carrier of the common and single message of hope for the future. The message of Thessaloniki is that education should be in the center of international, national and regional agendas, and is the foundation of all other pillars of sustainability namely Regulation, Innovation and Economy (Scoullos, 1999).

The Thessaloniki Declaration laid a foundation for education for sustainability while neutralizing the term environmental education. There are several reasons for the conference's outcome—most of which stem from a series of missteps that have been taken by the environmental education profession during the last 20 years since the Tbilisi conference and the Agenda 21 mandate for the promotion of the concept and implementation of education for sustainability (Knapp, 2000). It was also suggested that environmental education be referred to as education for the environment and

sustainability. It is believed that the latter term will be the new and holistic approach to attaining environmental stewardship (Knapp, 1998), a fact which had resulted in considerable opposition. This was based on the belief that the lack of actualisation of EE's goal was basically related to an operational dysfunction. Therefore the success of EE doesn't depend on the selection of a more appropriate name for the field.

The "Thessaloniki Declaration" reaffirms "the reorientation of education as a whole towards sustainability, involves all levels of formal, non-formal and informal education in all countries" and recommends that "action plans for formal education for environment and sustainability with concrete targets and strategies for non-formal and informal education should be elaborated at national and local levels" (UNESCO-EPD, 1997).

The most frequently cited definition of sustainability came from the report of the Brundtland Commission of the World Commission on Environment and Development, in its description of our "common future". Sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

At the elementary and high school level by involving students in environmental actions related to socioeconomic concerns has resulted in the development of sound environmental values. Inter-disciplinary approaches give students the opportunity to experience the holistic picture of the environment.

Formal, non-formal and informal EE have gone under an evolutionary transition. Members of these groups are concerned about deterioration of environmental quality, negative effects of global and local increases in human populations, environmental economic interactions, international aspects of resource management, and considerations of global sustainable development of natural and human resources, among others.

Though schooling is but a subset of education, it is frequently targeted as an appropriate mechanism by those promoting education for special purposes, including environmentalism. Schooling is perceived by many special interest groups, as an opportunity to reach large audiences (Brandwein, 1981). For a successful and effective education on sustainable development teachers and textbooks need to do more to foster creative problem solving which is the skill students need if they are going to tackle real world environmental problems. In the classrooms educators must encourage of dissonant ideas, involve cross disciplinary boundaries and give some reward and respectability for problem solving (Schmidt, 1996). But even the most creative students will need basic environmental knowledge to work with. Research findings (Hungerford et al, 1980) indicate that in order for individuals and groups to make informed decisions and take responsible actions regarding the environment, they need to be thoroughly exposed to all four of the following goal levels: ecological foundations, conceptual awareness of issues and values, an investigation and evaluation of issues and the training and application of citizenship action skills. Everyone must possess knowledge of and about environmental issues and must be able to act in order to achieve ecologically sustainable development. Education and training that inculcates facts, skills, understanding and familiarity are essential to the sustainable development problems. This must therefore be seen as part of a lifelong learning process taking account of the ecological conditions associated with economic, social and cultural developments. EE is a long term process that requires on-going support and participation for all sectors of society.

Hence, education and the creation of know-how for sustainable development must be aimed at people of all ages, from pre-school to middle-aged people and the elderly. In this respect, children are of particular importance because they act as "pioneers of sustainable development", influencing the attitudes of their parents and also because they must adopt a more responsible lifestyle which they will practice later on as adults. As children develop the knowledge, skills and attitudes necessary to make environmental decisions they should be allowed to form their own opinions because on the environmental issues there are no easy answers. Modern research has shown that the lifestyle people establish early in their lives is later retained, therefore an appropriate environmental lifestyle for our youth is what we should be investing on.

Teaching for Sustainable Development in Greece:

Environmental consciousness in Greece is growing but education on environmental concerns and citizens' understanding of the intricate interactions involved is still weak (Skanavis, 2001). Professional educators admit that Greeks' knowledge for sustainable development still faces difficulties. Citizens' EE tends to remain a marginalized and compartmentalized corner of most educational systems. Teaching for sustainable development can be promoted only when it is generously supported by policy making, teacher training, educational resources and pedagogical tools.

The adaption of the 1986 integrated institutional law for the protection of the environment in Greece and following the worldwide concern for environmental protection resulted in a significant research activity in the field of Environmental Sciences (Giokas et al 2001).

Grass roots environmental organizations have exerted pressure and have stimulated institutions, universities and policy makers to respond.

According to Gravanis (1997) EE has been an official part of education programs in Greek schools since 1991, but it was introduced in 1977 and has developed in 3 phases:

1977-1982. In the first phase, the Educational Institute in collaboration with the Secretariat of the National Council for Environment and City Design undertook the promotion of EE. The main results were: a) the creation of a bibliographic source of information, b) the training of 20 teachers at environmental centers in France, c) the organization of seminars on EE for teachers. In this phase only a small number of teachers participated (Gravanis, 1997).

1983-1990 In this phase a working party was formed that gave the opportunity to secondary schools to develop EE programs, while the Ministry of Education started organizing training seminars for teachers (Papadimitriou, 1998). Although many EE programs were developed during this phase, many teachers were unable to even recognize the term EE (Gravanis, 1997).

1990-2002. During this phase EE is recognized as part of the primary and secondary school curricula. According to the Greek law, EE programs can be introduced in the regular weekly curricula. In addition the Directorate Department of EE of the Ministry of Education established EE centers throughout Greece and appointed in each of the fifty-four provinces qualified expert in pedagogy with specialized knowledge of environmental matters to superintend the EE programs at a local level.

In the past 30 years, EE has helped the people of Greece to come closer to the understanding that in order to enjoy a good quality of life for ourselves and our children we must utilize in a responsible way our air, water and soil.
An informed and involved local community always does a better job of environmental protection than some distant protection. If we are to move beyond environmental regulation to true environmental protection then first businesses and communities must be full and active participants in solving environmental problems and second citizens must put their heads together to find new solutions for major industries in order to achieve results that are cleaner for the environment, cheaper for the taxpayer and industry and smarter for the future (Brown, 1995).
Worldwide the effect of human activity on the environment is rightly a matter of continuing concern both in general and for education in particular. Issues that are fundamental not only to education for sustainable development but also to the education as a whole have been brought up.
The specter of eco-catastrophe haunts both science fact and science fiction and it is now a common, if not yet standard aspect of general public policy-making to estimate the "environmental cost" of new projects. Products, which lay claim to being «environmentally friendly», are increasingly at an advantage in the market place and corporations which can successfully project an image of deep concern for the environment enjoy a singular respectability and sense of public trust. And of course consideration of the impact of human activity upon the environment is now an integral part of the National Curricula around the world. We must present attitudes and understanding that are engendered across all aspects of the curriculum and school experience from an environmental perspective (Bonnett, 1997).
In Greece, in the past couple decades national and local agencies, nongovernmental organizations (NGOs) and educational institutions have developed a wide variety of effective environmental programs. Initially most of these programs were connected with nature study, outdoor and conservation education but recently an enormous emphasis has been placed on citizenship, problem solving, and issues identification, an emphasis which is quite important since we all and on everyday basis need to make decisions that affect the environment and therefore our quality of life.
Universities carry the responsibility to foster environmental awareness in the community and the society at large by preparing citizens to evaluate and resolve environmental issues and by producing professionals trained to promote and support sustainable development.
There are 19 Universities and 14 Technological Institutions of Higher Education in Greece. While many institutions offer environmentally related majors, their courses are environmental applications in the specific field. Departments in the Greek Universities do not as a rule require basic instruction in environmental literacy and most of them do not even have an available course in education for sustainable development. A good percent of the Greek students are not enrolled in environmentally related programs and even worse they never enroll in a general environmental studies course. The last fifteen years special attention has been given to establish departments which will directly deal with Environmental Science.
This resulted, at the undergraduate level, in establishment of the department of Environmental Studies at the University of Aegean, the Department of Environmental Management and Natural Resources at the University of Ioannina, the Department of

Forestry and Natural Environment at the University of Thessaloniki, the Department of Environmental Engineering at the Dimokritio University of Thrace and at the University of Crete as well as couple "Extended Education" courses at the University of Ioannina (in Agro-Ecology) and University of the Aegean (in Environmental Cartography) (Giokas et al 2001).

At the graduate level, there is a serious involvement in research related to environmental issues with impressive scientific findings as well as investment in majors offering studies on the broad spectrum of environmental studies. Never-the-less, post-graduate courses on EE and Education for Sustainable Development are rare.

We are confronted in Greek academia with the difficlty that is experienced all over the world. EE isn't well understood. The majority of researchers are coming from natural sciences (chemists, biologists, geologists etc) and environmental engineering disciplines probably because they can more easily understand the nature of environmental mechanisms, functions and consequences. Offering a course in an environmental sciences or studies area cannot accomplish the goal of Education for Sustainable Development, it only covers a specific environmental area of interest. Students are in need of an environmental course which will supply foundamental environmental knowledge but primarily will demonstrate to students the inevitable connections between man, his culture, his natural surroundings, techology, society and economy. The key aim of such a course must be the development of values, attitudes, behavior and critical thinking skills that will motivate participants to demonstrate a personal and life-long interest and responsibility and an active involvement in environmental issues and in the environmental decision-making process. Education for Sustainable Development is a challenge which includes personal involvement and motivation to act, critical capacities and the nescessary skills to be able to identify and formulate problems. Students are given the opportunity to approach environmental issues from the holistic point of view rather than the causal relationship. When students are able to have an impact on matters of serious worldwide concern, they become dynamic, initiative, independent and responsible citizens.

Several Univerities in Greece have played a very important and specific role in the environmental education and awareness training of students by offering courses on environmental literacy (Table I).

Table I. University Departments offering Environmental Literacy Courses

University	**Departments**	**Courses**
University of Ioannina	Department of Primary Education	Environmental Education
University of Ioannina	Department of Environment and Natural Resources Management	Environmental Ethics and Education
University of Piraeus	Department of Technology Education	Ecology and Environmental Education
University of Aegean	Department of Environmental Studies	1. Environmental Communication 2. Environmental Education 3. Methods of Environmental Education
University of Aegean	Department of Primary Education	Ecology and Environmental Education
University of Crete	Department of Philosophy and Social Studies	Environmental Education
University of Crete	Department of Primary Education	Environmental Education
University of Thessaly	Department of Primary Education	Environmental Education
University Thessaly	Department of Special Education	Environmental Education
Aristotle University of Thessaloniki	Department of Forestry and the Natural Environment	Environmental Policy and Education
Aristotle University of Thessaloniki	Department of Primary Education	Environmental Education

Formatted

Teaching for Sustainable Development at the University of Aegean:

University of Aegean has come to the conclusion that the achievement of a sustainable society will be easier if our students gain the insight, ability and will to act to this end. The department of Environmental Studies offers courses in which students approach environmental issues trough study circles in order to have a broad perspective and also be able to work together irrelevant of their backgrounds. This way a solid background of knowledge and skills enabling students to deal with environmental conflicts related to aims and interests and their resolutions has been promoted. Therefore later on in their environmental careers and personal investments they include strong environmental aspects and are able to successfully communicate with the other stakeholders.

The Laboratory of Environmental Education and Communication, established in 2000, is strongly concerned with students' environmental literacy. The laboratory is charged with assessing the quality of EE and the development of students' dynamic and active learning by evaluating actions taken and outcomes. Dynamic learning reflects to intelligent acts and abilities to apply knowledge. Active learning relates to use of old knowledge in developing new procedures in order to solve concrete environmental problems. Problem solving involves the capacity to diagnose and evaluate the environmental situation, being exposed to other points of view and monitoring actions and consequences of the environment.

Studies have been carried out to assess teacher training which seems to be the weakest point due to inefficient initial training and a costly in-service follow-up. The results have brought up the need for adequate training and availability for teaching materials. Also models measuring the environmental behavior of students and of various "learning groups" have been utilized. The outcomes have proven useful in the development of non-formal EE programs.

The goals of the laboratory can be summarized in the following:

1. To advance and support national environmental education efforts to develop an environmentally conscious and responsible public and to inspire in all students a sense of personal responsibility for the care of the environment
2. To expand communication and partnerships
3. To educate youth to protect the environment
4. To promote the pursuit of environmental careers
5. To educate the adult public to increase literacy
6. To enhance learning opportunities across international boundaries

The approach has been based on the fact that instruction aimed at enhancing environmental literacy must aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated to working individually and collectively toward achieving a dynamic equilibrium between quality of life and quality of the environment. Environmental literacy needs to focus on developing environmental behavior. (Wilke, 1995) Therefore the following were implemented:

1. Development of four specific courses in EE which train students in the philosophy and methods of EE (including formal, non-formal and informal areas), environmental communication, citizen participation skills and problem solving as well as development of seminars and certificate programs for teachers of both primary and secondary education and encourage them to enroll. The long term goal of offered courses is to enable participants to gain a broad-based understanding of the

environment through direct experience with methods and processes. Also facilitate collaboration and communication among faculty about their reforms in teaching about the environment

2. Participating in joint programs with NGOs, museums and EE centers
3. Supporting a non-profit EE organization (SPATPE) run from undergraduates and graduates of the department of Environmental Studies who organize campaigns, design informative material in order to promote public awareness on environmental issues and visit schools where they make presentations to elementary and high school students. These activities result from University of Aegean Environmental Studies students' own incentives and on several occasions organized jointly with public national and local organizations
4. Establishing students' internship programs with environmental companies and organizations by bringing together business, academic and regulatory personnel and building networks among these groups
5. Contributing to mass media environmental awareness programs and projects and assessing environmental behavior of various citizens' groups in order to design EE programs and materials related to their needs
6. Developing joint educational programs on sustainable development on a graduate level with Turkey (involving the Black Sea Universities Network Association) and on an exchange basis with several North-American Universities. Interdisciplinary approaches are promoted and interactive learning is emphasized.

Conclusions:

In Earth in the Balance, former Vice President of USA Al Gore proposes to make "the rescue of the environment the central organizing principle for civilization". If the environment and humanity are to be rescued, those now being educated will have to do what the present generation has been unable or unwilling to do: stabilize world population, reduce the emission of greenhouse gases that threaten to change the climate, protect biodiversity, reverse the destruction of forests, conserve soils, use efficiently energy and materials, eliminate waste and pollution, manage wisely renewable resources and repair the damage done to Earth in the past 150 years of industrialization. And they must do all this, as Professor Orr states, while they reduce worsening social, ethnic, and racial inequities. No generation has ever faced a more daunting agenda (Orr, 1995).

The total population of Greece is around 11 million. (National Statistical Service of Greece, 2001). The number of University students, spread in the 19 Greek Universities, was estimated about 110,000 students in the academic year 1997-1998 which was 1% of the total population. Due to change of University entrance regulation it has been recently increased to about 1,5% of the total population.

Even though the group of University students represents a small fraction of the Greek population, it is an extremely important group because these students, once they are done with their studies, will empower Greece at the scientific, technological, research and managerial positions. According to Agenda 21, Chapter 36 it has been stated that EE must be included in all academic disciplines. Still in the Greek Universities Education for Sustainable Development is part of the curriculum of only few Universities and even in those in limited number of departments.

Building sustainable societies will be the hardest and most satisfying work most of us will ever do. There are few if any urgent tasks before us. Universities have the resources, vision, opportunity, and responsibility to lead themselves and their societies towards sustainability, one step at a time (Breyman, 1999).

The role of the Universities as major players in the move to attain sustainability all over the world is an agreed fact. Never-the-less the most successful division has been the environmental research because of the income associated with grants and the opportunities for publishing. Agenda 21, the blueprint for action calls though for aggressive measures to strengthen the teaching for sustainable development received by the world's citizens. Universities must implement programs that encourage environmental literacy and provide stewardship among the student population. Universities should implement an environmental studies course requirement for all graduates, or the development of an integrated general education program that accomplishes environmental literacy through its integration in a variety of courses (Wilke, 1995).

It is considerably easier to multiply environmental courses within disciplines, departments, and schools within a university than it is to devise new courses and curricula across them. And yet no single discipline has hegemonic purchase on analysis and resolution of environmental problems. There is an urgent need for development of multi- and interdisciplinary curricula if the "ecological literacy" necessary for construction of sustainable societies is ever to be achieved (Breyman, 1999).

Finally, if environmental issues are to become an integral part of instruction designed to change behavior, instruction must go beyond an awareness or knowledge of issues. Students must be given the opportunity to develop the sense of ownership and empowerment so that they are fully invested in an environmental sense and prompted to become responsible, active citizens (Hungerford and Volk, 1990).

References:

1. Bonnett, M. (1997), "Environmental Education and Beyond", Journal of Philosophy Education, Vol. 31 No 2, pp. 249-266
2. Brandwein, P.E. (1981), "Memorandum: On Renewing Schooling and Education", Harcourt Brace Jovanovich, New York, N.Y.
3. Breyman, S. (1999), "Sustainability through Incremental Steps? The Case of Campus Greening at Rensselaer", In: Filho, W. L. (ed), Sustainability and University Life, Peter Lang, Frankfurt am Main, pp. 79-88
4. Brown, C.M. (1995), "Why Environmental Education?", EPA Journal, Vol. 21, No 2, pp. 6-8
5. Giokas, D., Siskos, P. & Karayannis, M. (2001), "Environmental Education and Research in Greece", Environmental Science & Pollution Research Vol. 8 No 4, pp. 289-294
6. Gravanis, J. (1997), "Human Ecology: Environmental Education in Greece", In: Thompson, P. J. (ed), Environmental Education for the 21st Century: International and Interdisciplinary Perspectives, Peter Lang, New York

7. Hungerford, H.R., Peyton, R. B. and Wilke, R.J. (1980), "Goals for Curriculum Development in Environmental Education. Journal of Environmental Education 3:42-47
8. Hungerford, H.R. and Volk, T. (1990), "Changing Learner Behavior through Environmental Education", Journal of Environmental Education, Vol. 21 No 3, pp. 8-21
9. Kelley-Laine, K. (1997), "Education for Sustainability", The OECD Observer, Special Edition on Sustainable Development, p.14, June 1997
10. Knapp D. (1998), "The Thessaloniki Declaration-The Beginning of the End for Environmental Education", Environmental Communicator, North American Association for Environmental Education, Vol. 28 No 2, pp.12-14.
11. Knapp D. (2000), "The Thessaloniki Declaration: A Wake-Up Call for Environmental Education?" The Journal of Environmental Education, Vol. 31 No 3, pp. 32-39.
12. Mann, L.D., and Stapp, W.B. (1982), "Thinking Globally and Acting Locally", Environmental Education Teaching Activities. ERIC/SMEAC, Colombus, Ohio
13. National Statistical Service of Greece (2001), "Greece.... in figures", Available in http://www.statistics.gr/new_site/Hellenic/MainPage/docs/hellas_in_numbers.pdf (21-1-2001)
14. Orr, D.W. (1995), "Educating for the Environment: Higher Education's Challenge of the Next Century", Change Vol. 27 No 3, pp. 43-46 May-June 1995
15. Palmer J. (1998), "Environmental Education in the 21st Century: Theory, Practice, Progress and Promise", Routledge, London
16. Papadimitriou, V. (1998), "Environmental Education and School", Tipothito, Athens (In Greek). ?apad?µ?t???? ?. (1998), ?e??ßa????t??? ??pa?de?s? ?a? S???e??, ??p???t?
17. President's Council on Recreation and Natural Beauty (1969), "A Report of the American Environment", Journal of Environmental Education, pp.27-28
18. Schmidt, K. (1996), "Green Education Under Fire", Science Vol. 274 Dec 13 pp. 1828-1831
19. Scoullos, M, (1999), "Education for Environment and Sustainability (EfES): International and EuroMediterranean Experience", paper presented in the conference "Environmental Education and Training in Europe", organized by the European Commission, Brussels 3-4 May 1999, Available in http://europa.eu.int/comm/environment/eet/session2.pdf (10-1-2002)
20. Skanavis, C. (2001), "Assessing the Environmental Values of Greek Citizens", In: Proceedings of the Symposium Sustainable Development and a New System of Societal Values, Schloss Seggau, Leibnitz Austria December 3-4 2001, Sustain, Graz, Austria, pp. 61-69
21. Stokes, B. (1981), "Helping Ourselves: Local Solutions to Global Problems", Worldwatch. Inst., Washington, D.C.
22. UNCED (United Nations Conference on Environment and Development) (1992), "Agenda 21, the United Nations Programme of Action from Rio", New York:NY Department of Public Information
23. UNESCO (1978), "Final Report-Intergovernmental Conference on Environmental Education. Organized by UNESCO in Cooperation with UNEP, Tbilisi, USSR, 14-26 October 1977", UNESCO ED/MD/49, Paris

24. UNESCO (1987), “Moscow '87: UNESCO-UNEP International Congress on Environmental Education and Training (USSR, 17-21 August 1987)”, Connect, Vol. 12 No 3, pp. 1-2.
25. UNESCO-EPD (1997), “Declaration of Thessaloniki”, Unesco publications No EPD-97/CONF. 401/CLD.2, Paris
26. UNESCO-UNEP (1976), “The Belgrade Charter” Connect: UNESCO- UNEP Environmental Education Newsletter, Vol. 1 No 1, pp. 1-2
27. WCED (World Commission on Environment and Development) (1987), “Our Common Future”, Oxford University Press, Oxford

Wilke, R. (1995), “Environmental Literacy and the College Curriculum”, EPA Journal Vol. 21 No 2, pp. 28-30. Spring 1995

Return to Contents

37. Sustainability Education in Tertiary Curricula: a great idea, now what is stopping it happening?

Dr Ian Thomas

RMIT University, Melbourne, Australia

Dr Ian Thomas
School of Social Science and Planning
RMIT University
GPO Box 2467V
Melbourne
Victoria, 3001
Australia
Fax +61 3 9925 1855
Ian.thomas@rmit.edu.au

Abstract

Formatted

For a decade or more the concepts of environmental education and education for sustainability have been acknowledged by many tertiary institutions. An appreciable number of institutions have gone further and signed agreements that, at least in part, make them responsible for changing their curricula so that students in all disciplines will be educated about sustainability. In Australia several of the institutions of higher education have signed the Talloire Declaration, yet a recent survey of the Australian institutions indicated that there is little indication that their curricula has been changed to include sustainability education. It appears that while there is wide-spread support for the idea of students being educated in sustainability, there is little progress on its implementation. Royal Melbourne Institute of Technology (RMIT) University (Australia) is a case in point and is used to outline the issues associated with large-scale curriculum change in a complex organisation. The experience suggests that those concerned about education and environment/sustainability need more than conviction and a vision to bring about change. A strategic approach, based on change management in organisations supported with staff development, is needed to implement these sorts of change. The general theories of organisational management provide a guide for change, but the particular culture of tertiary institutions and their staff has to be considered. Rather than attempting to outline a grand plan/model for implementation, the paper will identify key issues and look into the current experience associated with implementation approaches. Importantly, this examination raises challenges those of us who are grappling with implementation of curriculum change. It is also an examination that will benefit from wide discussion, involving those who have experience with implementation of sustainability education, and those who are embarking on the introduction of tis curricula.

Introduction

There is fertile ground for sustainability education in tertiary institutions. This has been the situation for a decade, yet sustainability education, or education for sustainability, is still not 'the norm'.

There is clear justification for having education for sustainability in tertiary institutions. The general community has identified the need to take account of the impacts of our activities on the environment, as is apparent in 'Caring for the Earth: A Strategy for Sustainable Living' (IUCN/UNEP/WWF, 1991) and the United Nation's Agenda 21. Equally, the business community and professional associations see the need to take better care of the environment (for example Barbera, 1994; Cairncross, 1995; Callenbach et al., 1993; Royal Australian Institute of Architecture, 1995; and Schmidheiny, 1994). Clearly there is a rationale, and need, for graduates to develop 'literacy' in sustainability as part of their tertiary education.

Many students already have a broad environmental awareness when they come to tertiary institutions (Ridener, 1997), although this does not necessarily give them the ability to assess environmental issues and take action on them. To a degree, this deficiency is redressed by the incidence of specialised tertiary environmental programs, which is high and has been increasing (Cosgrove and Thomas, 1996; Wolfe, 2001). However, there have been calls for a better coverage of environmental matters, through the various conservation strategies, and sustainable development processes, that have emphasised the need for environmental education to have a higher profile at tertiary institutions (Victorian Government, 1987; Commonwealth of Australia, 1994). Despite this history, in 1998 the President of the Australian Association for Environmental Education was moved to reiterate the need for the development of environmental literacy:

> "Universities need to find the ingenuity to blend all the disciplines so that we will increasingly see schools of business and economics teaching environmental awareness and education. … If we continue to produce lawyers, business people, teachers, doctors, politicians, and other graduates while failing to create in them a high degree of environmental literacy, a university is not fulfilling the obligations it has to society." (Dingle, 1998; 3-4)

The situation is not entirely negative as some graduates are receiving an environmental literacy through the specialised environmental programs, such as environmental science, environmental engineering, and environmental studies. However, these programs are often based in a single discipline, and are not intended to aid development of environmental literacy in other programs. Consequently, apart from the occasional course that is often an elective, most tertiary students have few opportunities to participate in environmental education. Yet this is happening at a time when there is a growing interest in the need for environmental, and sustainability, literacy of all the graduates of tertiary institutions.

There has been increasing support from across the community for the implementation of environmental literacy and sustainability education at tertiary level (Thomas et al: 1999: 2). Whether the organisations are called universities or institutions of higher education, at the international level this movement has been facilitated by the development of several initiatives aimed at the tertiary sector, especially:

. Talloires Declaration of University Leaders for a Sustainable Future, October 1990
. Halifax Action Plan for Universities of the conference on "Creating a Common Future," December 1991
. Swansea Declaration of the Association of Commonwealth Universities, August 1993
. Copernicus University Charter for Sustainable Development of the Conference of European Rectors, Autumn 1993
. Kyoto Declaration of the International Association of Universities, November 1993
. Student Charter for a Sustainable Future of the student unions of the United Kingdom, July 1995
. The Haga Declaration, for Baltic countries, March 2000 (Kliucininkas, 2001; ULSD, 2001)

Particularly well recognised is the Talloires Declaration which, according to University Leaders for Sustainable Development (2002) has been signed by over 280 institutions from 47 countries across five continents. Importantly the institutions that sign this declaration commit themselves to operational activities and curriculum initiatives that lead to sustainable development.

There has been much discussion about the meaning of sustainability education: this issue is covered in Filho (2000); Thomas et.al. (1999) and (2000). For the purposes of this paper I will be taking the terms sustainability education, education for sustainability, environmental literacy (even Triple Bottom Line literacy) to all embody Orr's (1992) points. In his terms, 'education for sustainability', contains several aspects:

. the need to accept the probability of survival of our species
. an attitude of care or stewardship - particularly an "...uncompromising commitment to life and its preservation" (p133)
. the knowledge necessary to comprehend inter-relatedness, of "...disciplines and of the disparate parts of personality: intellect, hands, heart" (p137);
. the practical competence required to act on the basis of knowledge and feeling.

These key elements are also the basis of environmental education, expressed in its broad sense, and of environmental literacy (Thomas et.al., 2001). Importantly, specifically related to the element of 'heart', recent discussion relating to education 'for sustainability' indicates the need for a focus on values and environmentally ethical activity to be an integrated component of the curricula (Sterling, 1996).

To achieve this literacy and environmental understanding the broad pedagogical models for the incorporation of have been worked out. As identified by Dyer (1996) and Woods (1994) they are, in summary:

. the inclusion of the coverage of some environmental issues and material in an existing course of the program;
. having a separate course that deals specifically with environmental matters;
. integrating environmental issues and discussion into all courses so that environmental understanding is developed in the context of the discipline, the program, and the course material.

In programs where there has been an attempt to introduce environmental discussion the first two approaches appear to have been used, while the latter has usually been reserved for the specialist environmental programs; although Klaschka (2001), in arguing for the adoption of sustainability education, also argues for the integration of environmental understanding in science programs. The advantage of the course-based approaches is that they are relatively easy to introduce, provided staff feel comfortable about working outside the strict boundaries of their disciplines. The disadvantage is that students can interpret the environmental material, and its messages, to be 'in addition' to their core (disciplinary) studies, and therefore not as important.

To support these models, curriculum structures and materials are required. These materials are readily available (for example Alverez and Kyle, 1998; and Second Nature, 2002), however, they do not seem to have been widely used. We can speculate on the reasons for this. For example, the key issues may be academics' limited knowledge of the availability of these materials, how to use them, and why their engagement with sustainability education is important.

Even with the flexibility of curriculum models and the availability of support materials, we still see little indication that the majority of graduates have the sort of eduction, or literacy, outlined by Orr (above). Consequently, from this point the paper focuses on some institutional issues that could be inhibiting curriculum change, and how they may be overcome. I briefly consider the results of recent surveys to assess the extent of sustainability education, with a focus on Australia, and the barriers to curriculum change. Then I discuss the key areas that need working on to assist the expansion of education for sustainability.

Status of Sustainability Education in Australia

A recent survey of Australian tertiary institutions by Carpenter and Meehan (2002), with a low response rate of ten, indicated that for the majority environmental management could not be identified as a key activity. At a basic level, the specific teaching and research activities of the universities were connected to environmental principles for most of the institutions. However, at a deeper level, only one made a specific reference to 'greening' the curriculum.

A parallel but unrelated survey with responses from 21 institutions (slightly more than a third of all the Australian institutions) found considerable confusion over the concept of sustainability education (Thomas and Nicita, 2002). In part this may have been associated with Filho's (2000) observation that the concepts of sustainability and sustainable

development are contested. His investigations indicated that people in the institutions sampled in his study thought:

. sustainability is too abstract, or too broad
. institutions have no personnel to deal with sustainability
. sustainability demands substantial resources that institutions either do not have or can not justify
. sustainability lacks a scientific basis.

Nonetheless, at the time of our survey in late 2000, the majority of responding institutions said education related to sustainability was covered in their curricula. This is a good start, however, only a small minority replied that sustainability education was included in all disciplines. The results indicated there was a general appreciation that sustainability education has a clear place in tertiary curricula, but only a handful of Australian institutions had done so or were working to that point. This was a different picture compared with the number that were including sustainability education in the curricula of specific departments or disciplines.

Subsequently, a web-based survey and a written questionnaire survey was conducted by Bekessy and Burgman (2001) to gain an understanding of the environmental practice in Australian universities and a selection of international universities. They specifically sought information about the institutions' operations and curricula and concluded "that most universities in Australia and elsewhere in the world have moved significantly towards sustainable practices in recent years." (p2). Regarding the curriculum, a slight majority of Australian institutions responded that the extent to which courses addressing sustainability within their institution was either 'quite a bit' or 'a great deal'. Responses related to the integration of environmental knowledge, values and ideas into courses across institutions, however, indicated that participation was at a low level; less than a quarter indicated 'quite a bit' or 'a great deal'. If the confusion that was apparent in the 2000 survey (above) still exists, this level of participation could be even smaller. Further, as an adjunct to the limited curricula coverage of sustainability, Bekessy and Burgman (2001) found that funding to students or departments, as an incentive to take or offer environmental studies, was generally low.

Clearly the results of these recent surveys indicate that the adoption of sustainability education, that will empower all tertiary students in Australia, is at a low level. This suggests there are still substantial barriers evident in the Australian tertiary system, and it is more than possible these barriers are also operating at institutions internationally.

Barriers to Sustainability Education: experiences at RMIT University

Since 1996 two attempts have been made to introduce sustainability education at RMIT. The first used the 'lever' of interesting staff in the coverage of waste minimisation (see Thomas etal., 1999). On the basis of working with the staff of four programs of different disciplines and involving three faculties, a strategy for introducing curriculum change was developed. This strategy did not include the development of specific materials, as it was apparent that staff who were generally interested in waste did not find difficulty

gaining access to relevant materials. Rather, it focused on working with the supports provided by the institutional (RMIT), educational, and professional/industry contexts, and establishing a process to work with staff and students. The outcome was that, without the resources to support staff and pursue the strategy across the institution the initiative has languished. However, using the waste minimisation study as a guide, a modest study of the development of environmental literacy within three programs, based in one multidisciplinary faculty, was attempted. The report of the project concluded:

"The Environmental Literacy Project demonstrated that the "diffusion model", in which already committed individuals are expected to change the entire culture of departments from the bottom up, is not going to work. What is also required, if RMIT is to fulfil the commitments it has made by signing the Talloires Declaration, is active leadership from the top, a new approach to staff development, and adequate resources to allow staff to integrate environmental content into their teaching material." (Findlay and Thomas, 2000; 8)

Again the initiative lapsed for want of sustained motivation for the staff involved. In both cases there was enthusiasm from the staff who were directly involved, but no opportunities were provided to expand that enthusiasm to the other staff of the programs through staff training/development. As a consequence the motivated staff were quickly caught up in the day-to-day demands of their programs. Even though the opportunity to broaden the curricula of the programs to include waste minimisation and to develop broader environmental literacy were not taken, some staff involved in the two studies did take the concepts into their own teaching and courses.

Barriers to Change: general experience

In some situations Alabaster and Blair (1996; 98) may be correct when they suggest that academic staff are "...often ideologically resistant to curriculum changes that emanate from outside the bounds of their discipline." However, it had been apparent that those involved in the RMIT studies had expressed strong interest in sustainability education. Presumedly, other considerations dissuaded them from developing this focus in their teaching. For instance, in the opinion of Cowell et.al. (1998) resistance to change can come from structural constraints, such as the financial and administrative difficulties of developing cross-departmental (usually cross disciplinary) initiatives. These authors have also identified many pressures faced by individual academics in an institution. Coupled with the observations of the RMIT study group these pressures lead to a substantial list of barriers to change, ie. academics may:

. not know enough about the environment;
. not know where/how to obtain relevant information;
. not see how to combine information about the environment with the core knowledge of their course;
. not feel comfortable working across disciplines, as needed when disciplinary knowledge is taught in the context of environmental understanding;
. be concerned that this environmental understanding would not be considered appropriate for their graduates, or their disciplines;

. not be rewarded for such innovation;
. feel unsupported;
. see the possibilities for changing current programs as being too difficult;
. be concerned that what is appropriate for one program/discipline is not transferable to another;
. have increasing calls on their time for administrative, research and discipline related matters.(Thomas etal., 1999)

Further, after reviewing a number of empirical studies and commenting on their own studies, Dahle and Neumayer (2001) summarised the factors they felt act as barriers to tertiary institutions actively implementing green actions as:

. a fundamental lack of interest and commitment towards green initiatives among administrators, staff and students
. a lack of financial resources and environmental education within the campus community (also identified by Kliucininkas, 2001)
. the organisational structures and the predominating culture of the university preventing the introduction of greening initiatives
. the lack of expertise, the lack of tradition
. a long period before the benefits of the efforts of change are seen
. a general lack of incentives and information on environmental issues
. misconceptions related to the topic 'sustainability'.

They also drew attention to: the need for institutions to have staff trained and competent in sustainable development; the need for all students to be provided with relevant sustainable development learning opportunities; and to the role of the role of the 'campus culture' as being another key barrier to undertaking environmental initiatives.

The common threads coming from all these experiences can be summarised as:

. a lack of a culture, where value or priority is given to greening/sustainability
. a lack of organisational and resource support for staff
. a lack of training for academic staff.

These barriers provide clear directions for change.

Confronting the Barriers: Directions for Change

In broad terms looking at the development of improved environmental management in business organisations provides some general directions for what may be expected in tertiary institutions. For example Bhargava and Welford (1996) and Scallon and Sten (1997) have discussed the various perspectives that organisations hold about the need for change and the degree of change organisations are seeking. A specific mechanism for change is the growing use of Environment Management Systems (EMS), now enshrined in the international standard ISO 14001 (see Sheldon, 1997) is important for the greening of business. A key element of these EMSs is the requirement for the organisation's staff to receive training and, as Thomas and Olsson (1998) argue, this provides an important vehicle for changing individual and organisational approaches to the environment. However, while some tertiary institutions have developed EMSs, the emphasis seems to

be on the campus operations (waste management for example) rather than on the activities of the whole institution (Herremans and Allwright, 2000).

Tertiary institutions are complex organisations. Their diversity of 'products' (teaching, research, consultancy, community connections and training) is daunting enough, but when these are interconnected with the range of disciplines at a typical institution, administration and operation become increasingly difficult. Yet on top of all this is the variety of staff - most particularly the academics who have been encouraged to bring their individuality, of expertise and research, to their jobs. This makes it difficult for top management to direct change, since guiding a group of academics who prize their individuality, analytical skills and creativity would be like 'herding a mob of cats' (a difficult if not impossible task).

In an attempt to encourage these 'cats', there are many proposals for how to develop sustainability education in tertiary institutions. As examples the suggestions of Jucker (2002) and Kliucinin kas (2001) are outlined in Figure 1. These suggestions cover a lot of territory and range from actions for an individual teacher, to actions for the general community. This leaves open the issue of what specifically can be done at the level of institutions.

If we are to bring about change in these institutions, to develop education for sustainability, we need to recognise that the scope of curriculum change we are looking at is in essence organisational change. There is ample literature on organisational change; for example Bennett etal., 1993; Dawson, 1992; Dunphy and Griffiths, 1998; Henry and Walker, 1991. This literature provides guidance for instituting change, especially the recognition of the stages of change. In this context attention has been given to categorizing organisations in relation to the extent that they have embraced change to become 'greener' or more sustainable. For example Bharagava and Welford (1996) review a range of terms, but ones that are broadly consistent, to indicate the transition of business organisations from indifference about environmental matters to the position of a green firm. With the specific interest in developing an environmental management approach in tertiary institutions, Carpenter and Meehan (2002) comment on the continuum of Hunt and Auster to describe the stages whereby environmental management becomes a mainstream activity. These stages progress from beginners, through fire fighter, concerned citizens, and pragmatists, to proactivists. Carpenter and Meehan (2002) also reflect on the factors that move a tertiary institution through these stages. Referring to a model by Laughlin they see that when pressures come for change (as a result of new commercial realities, community expectations or legislation) in the first instance, the change is externalised and largely ignored. At the next level some changes occur only in sub-systems. Subsequently changes are deeply embedded where change is forced through regulative or other outside pressures, or where the ogranisation becomes a 'market leader' and takes a proactive approach. These observations are useful at a theoretical level. However, irrespective of the stages, the key issue for change has been succinctly stated by Walton (1995; 151):

> "Full and complete change means changing peoples' *behaviour*, and that inevitably means changing …the values, culture, climate, informal operating style, rituals, communications patterns, and so on …"

In a traditional analysis of organisational change we would expect the direction for change to come from the top (management and/or academics). Emerson and Welford (1997) note, in the context of change for improved environmental management, there is usually an acceptance that change is top-down:

> "It is commonly argued that environmental policy change starts with a 'commitment from the top management', which is enshrined in the mission statement, which includes 'total change in the organizational culture and strategy' and then 'policy is defined' which is 'cascaded down the organization'. Rarely do we see the whole process being owned by those who will have to ensure that it is operable." (p18)

In tertiary institutions the top-down approach also faces inertia generated by the academic 'cats'. Nonetheless, support, if not guidance from the top is clearly an important factor in sustaining curriculum change.

At the same time there are many indications that for the sort of curriculum change we are discussing a 'bottom-up' approach may be important. This is the current situation, it seems, where the tertiary leaders have generally not given priority to developing a culture to support sustainability education. In this case, students could be involved in acting as advocates for environmental change. Dahle and Neumayer (2001) suggest that this type of 'bottom-up' approach might be effective as students may feel freer to criticise campus actions, and, as 'customers' at their institutions, students can have power for demanding change. They also comment on the role of students acting as examples to their fellow students to bring about attitude and behaviour changes. However, Dahle and Neumayer (2001) caution that while the importance of students' 'bottom-up' advocacy role is necessary in raising awareness, a 'top-down' approach, where the academics serve to promote environmental education, is an essential component for change, since it is the academics who have a unique power to inspire students to follow their example.

Bottom-up approaches also relate to the institution's lower and middle level staff. Academics as individuals and networks can, and have, promoted change. Meima (1997) comments that key individuals who have commitment and 'charisma' can be very important in initiating and sustaining change. Also there is a role for individuals in organisational change. Rice (2000) sees that there are opportunities for 'strategic termites' who can bring about change through strategic actions within the organisation. However, for this to be a 'ground swell', other staff would have to have awareness of sustainability, and appreciate its relevance to their work.

The possibilities for these lower level staff to precipitate change have been identified by authors like AtKisson (1999) and Whiteley (1995). They have written generally about the instigation of change, but particularly about the importance of appreciating innovation diffusion and of the role of shared core values amongst the key staff. Overlying the

specifics of the implementation approach are three strategies for motivating change. According to AtKinson (1999), transformation will be assisted by:

. promoting the new - highlight the benefits of the innovation, noting its superior features
. critiquing the old– attack the status quo, directly or subtly, and pointing out the problems and weaknesses
. facilitating the change - reduce the perceived cost of the change, and put effort into making the change as easy as possible; hopefully turning the change into a perceived nett gain.

He sees these strategies being used by a network of people interested in the change (the key players and their relationships are summarised in Figure 2).

The importance of staff training, to develop awareness and the ability to incorporate sustainability education into curricula, has been identified previously. It also relates closely to the broader issue of an institution's culture and behaviour change. Specifically, for Lynton and Pareek (2000), training of staff is a fundamental aspect of the process of organisational change. Clearly training is very much part of the range of issues relate to Atkinson's point about facilitating change.

With a focus on tertiary institutions, Dahle and Neumayer (2001) believe that the most important action for reducing barriers to these institutions adopting sustainability approaches is to raise environmental awareness within their communities. In particular they see the need to help staff and students understand the benefits and importance of engaging with sustainability practices. For staff development programs there have been many suggestions related to the details of the training component of an institutional change strategy. For instance, proposals from Filho (2000) include:

. in-service training on matters related to sustainability
. using working groups to identify and implement specific projects;
. developing networks within and across institutions to exchange ideas and experiences;

Similarly, Bird (1996) has outlined the training elements that levels of staff need, and suggests how the training could be delivered, while Wemmenhove and de Groot (2001) have emphasised the issue of student-activating approaches to teaching for sustainability.

Some institutions provide staff training so there are experiences that we can draw on. The survey of Lithuanian tertiary institutions by Kliucininkas (2001) found that about a third provided staff training programs on sustainable development, but only a small number provide in-service training for teachers in the field of sustainable development. Outside Europe, specific institutions such as Tufts University, in Boston, have several years of experience in staff training (Creighton, 1998) and can assist those beginning the process. Likewise, Chameau (1999) outlines the strategies that Georgia Institute of Technology have developed to expand the capabilities of its academic staff members, so that they can establish close connections between learning in the classroom and the discovery that comes from research and practice in the environmental management of the campus.

There is no shortage of suggestions and examples for how staff development can be undertaken. The deficiency seems to be the inability of tertiary institutions to accept the need for these programs, and especially to implement them.

Conclusion, or Starting Point

I have illustrated that the arguments to introduce sustainability education, across all the programs of an institution, are strongly supported. It is difficult to see anyone arguing against the general principles of this curriculum initiative. Internationally there has been a steady move by institutions to commit themselves to the introduction of sustainability education, while researchers and practitioners have been working to develop appropriate pedagogy and support materials. Yet, the need for this curricula development has been accepted by only a small number of institutions, as epitomised by the current situation in Australia. The reasons for this tardiness are related to the barriers identified earlier, ie. the lack of:

. a culture, where value or priority is given to greening/sustainability
. organisational and resource support for staff
. training for academic staff.

The strategy to jump these barriers will involve an understanding of organisational culture and change. A key element of this change will involve academic staff development. Again, this in an area where there are many working models and considerable accumulated experience. It is not that we do not know what to do; rather, the issue is exerting the will to do it.

At this stage we have a lot for guidance for what needs to be done. In this paper I have identified the possibilities for bringing about change, and have provided some directions for where resources to facilitate change can be found. To date those of us concerned about environmental education in tertiary institutions have concentrated on the 'low hanging fruit' (to use a term popular in environmental management) – producing curriculum materials, and developing sustainability courses. These have been essential stages along the road to the bigger picture sustainability education. However, now we are at the point where we have to meet the much harder task of altering the system that directs curriculum; that is the institution or organisation itself.

I trust that the discussion outlined in this paper will have two outcomes. Firstly, that tertiary educators will be enthused to debate the issues I have raised. Secondly, that the focus on organizational culture and change provide a direction for us to 'get on with it' and work for the implementation of sustainability education.

Figure 1 – Examples of Proposals for the Development of Sustainability Education

Strategies of Jucker (2002), with particular relevance to individual teachers -

. make education for sustainability the transdisciplinary core of all education

. redefine notions of excellence

. enable self-determination in learning

. do, and you will learn or going for the big picture and facing the consequences

. practice what you preach

. we are the problem, not the solution

. open your eyes (to relearn ways of achieving change)

. don't wait for any leaders to get round to act

. education for sustainability means learning for all, including the experts

Proposals outlined by Kliucininkas (2001), with relevance to tertiary institutions and the general community -

. extended dissemination of sustainable development concept in the society

. development of study materials and methodologies for sustainability studies at universities and colleges

. inclusion of fundamental courses on sustainable development into undergraduate level curricula;

. implementation of dynamic modes of study (Internet, video-conferences, etc.)

. preparation of vocational and in-service training of secondary school teachers;

. support of sustainability principles and their implementation into the specialty studies (programs of sustainability and environmental studies)

Figure 2 - Key Players and Their Connections for Change in Organisations

Significant change is seldom the result of just one person, rather it comes from co-operation, as in an 'amoeba of culture'. The connections (and stages) within this amoeba are as follows (AtKisson, 1999):

1. innovation will come from an innovator, usually poor at communicating and 'selling' their idea or vision
2. a change agent actively promotes the idea, by translating the innovator's concepts into explanations that others can understand.
3. the change agent promotes the idea to 'early adopters' or 'transformers' (leaders among mainstream people, open to new ideas but cautious about ones that they promote, because they want to maintain their status
4. 'mainstreamers' adopt the idea - the transformer may have toned down the idea, by reducing how radical is appears, to ensure that the mainstreamers follow.
5. innovators, change agents and transformers may have developed connections to develop this strategy of change, but equally there may be no specific plan, and the individuals come together, or take their cues, by chance.

References

Alabaster, T. and Blair, D. (1996) Greening the University, in Huckle, J. and Sterling, S., *Education for Sustainability*, Earthscan, London, pp86-104.

AtKisson, A. (1999) *Believing Cassandra: An Optimist Looks at a Pessimist's World*, Chelsea Green Publishing, White River Junction.

Alvarez, A. and Kyle, L. (1998) *Integration of Waste Minimisation Principles into Higher Education Curricula*, EcoRecycle Victoria, Melbourne.

Barbera, M. (1994) *Environmental Issues: A Challenge for Management Accountants*, Australian Society for Certified and Practicing Accountants, Melbourne.

Bekessy, S. and Burgman, M. (2001) *Environmental Best Practice in Australian and International Universities*, unpublished report to the Vice Chancellor University of Melbourne, November.

Bennett, S.J., Freierman, R. and George, S. (1993) *Corporate Realities and Environmental Truth: Strategies for Leading Your Business in the Environmental Era*, John Wiley, New York.

Bharagava, S. and Welford, R. (1996) Corporate Strategy and the Environment: the Theory, in Welford, R. (ed) *Corporate Environmental Management: Systems and Strategies*, Earthscan, London, p 13-32.

Bird, A. (1996) Training for Environmental Improvement, in Wehrmeyer, W. (ed) *Greening People: Human Resources and Environmental Management*, Greenleaf Publishing, Broom Hall, pp227-246.

Cairncross, F. (1995) *Green Inc: Guide to Business and the Environment*, Earthscan, London.

Carpenter, D. and Meehan, B. (2002) Mainstreaming environmental management: Case studies from Australasian Universities, *International Journal of Sustainability in Higher Education*, Volume 3, Issue 1, pp19-37. Available ProQuest Information and Learning Company [May, 2002].

Chameau, J.L. (1999) *Changing a Mind-Set, Not Just a Problem-Set: Sustainable Development in Colleges of Engineering*, Tools and Resources, Second Nature Northeast Regional Workshop on Education for Sustainability, November 5-7.

Commonwealth of Australia (1994) *National Strategy for Ecologically Sustainable Development*, AGPS, Canberra.

Cosgrove, L. and Thomas, I. (1996), 'Categorising Tertiary Environmental Education in Australia', *Australian Journal of Environmental Education*, Vol. 12, pp 27-34.

Cowell, S.J., Hogson, S.B. and Clift, R. (1998) 'Teamwork for Environmental Excellence in a University Context', in Moxen, J. and Strachan, P. A. *Managing Green Teams*, Greenleaf Publishing, Broom Hall, pp131-144.

Creighton, S.H. (1998) *Greening the Ivory Tower: Improving the Environmental Track Record of Universities, Colleges and Other Institutions*, Massachusetts Institute of Technology, Massachusetts, USA.

Dahle, M. and Neumayer, E. (2001) Overcoming barriers to campus greening: A survey among higher educational institutions in London, UK, *International Journal of Sustainability in Higher Education*, Volume, 2, Issue, 2, pp139-160. Available ProQuest Information and Learning Company [May, 2002].

Dawson, S. (1992) *Analysing Organisations*, 2nd edn., Macmillan Press, London.

Dingle, P. (1998) President's Report, *OZEE News*, Issue 73 July, pp3-4.
Dunphy, D. and Griffiths, A. (1998) *The Sustainable Corporation: Organisational Renewal in Australia*, Allen and Unwin, St. Leonards (NSW)
Dyer, C. (1996) *Moving from Rhetoric to Reality: An Initial Exploration of Theories and Approaches to Curriculum Greening Appropriate to the Faculty of Environmental Design and Construction*, RMIT University, Melbourne.
Dyer, K. (1997) 'Environmentalism as Social Purpose: in Higher Education: A Green Education Agenda', *Australian Journal of Environmental Education*, Vol. 13, pp37-47.
Emerson, T. and Welford, R. (1997) Defining the Problem: Diagnostic Tools to Explore the Evolution of Unsustainable Practices in Organizations, in Welford, R. (ed) *Corporate Environmental Management 2: Culture and Organizations*, Earthscan, London, pp11-25.
Findlay, M. and Thomas, I. (2000) *Environmental Literacy Project: A Report*, unpublished report to Faculty of the Constructed Environment, RMIT University, Melbourne.
Filho, W.L. (2000) Dealing with misconceptions on the concept of sustainability, *International Journal of Sustainability in Higher Education*, Volume 1, Issue 1, p9. Available ProQuest Information and Learning Company [May, 2002].
Herremans, I. and Allwright, D.E. (2000) Environmental management systems at North American universities What drives good performance?, *International Journal of Sustainability in Higher Education*, Volume 1, Issue 2, p168. Available ProQuest Information and Learning Company [May, 2002].
IUCN/UNEP/WWF (1991) *Caring for the Earth: A Strategy for Sustainable Living*, International Union for Conservation of Nature and Natural Resources, United Nations Environment Program and World Wildlife Fund, Gland, Switzerland.
Jucker, R. (2002) "Sustainability? Never heard of it!" Some basics we shouldn't ignore when engaging in education for sustainability, *International Journal of Sustainability in Higher Education*, Volume 3, Issue 1, pp8-18. Available ProQuest Information and Learning Company [May, 2002].
Keniry, J. (1995) *Ecodemia: Campus Environmental Stewardship at the turn of the Twenty First Century: Lessons in Smart Management from Administrators*, Staff and Students, National Wildlife Federation, Washington.
Klaschka, U. (2001) Six Suggestions on How to Improve Environmental Education at Universities of Applied Sciences, in Filho, W. L. (ed) *Environmental Careers, Environmental Employment and Environmental Training: International Approaches and Contexts*, Peter Lang, Frankfurt, pp65-84.
Kliucininkas, L. (2001) Assessment of sustainability: Studies at universities and colleges in Lithuania, *International Journal of Sustainability in Higher Education*, Volume 2, Issue 3, pp250-256. Available ProQuest Information and Learning Company [May, 2002].
Lynton, R. P. and Pareek, U. (2000) *Training for Organizational Transformation– Part 1: For Policy Makers and Change Managers*, Sage, New Delhi.
Meima, R. (1997) The Challenge of Ecological Logic, in Welford, R. (ed) *Corporate Environmental Management 2: Culture and Organizations*, Earthscan, London, pp26-56.

Orr, D. W. (1992) *Ecological Literacy, Education and the Transition to a Postmodern World*, State University of New York Press, Albany.
Rice, S. (2000) *Strategic Termites and You– Perfect Together*, Environmental Opportunities, Inc., accessed 28 August, 2001, http://www.enviropps.com/ac_art4.html.
Ridener, L.R. (1997) 'University Students' Attitude to the Environment: An Australian/USA Comparison and the Effects of an Educational Program', *Australian Journal of Environmental Education*, Vol. 13, pp77-84.
Royal Australian Institute of Architecture (1995) *Environmental Design Guide*, RAIA, Melbourne.
Second Nature (2002) *Resource Center*, accessed 22 May, http://www.secondnature.org/resource_center/resource_center.html
Scallion, M. and Steen, M. (1997) 'Environmental Positioning for the Future: A Review of 36 Leading Companies of the Pacific Northwest Region of the United States of America', in Legerwood, G. *Greening the Boardroom: Corporate Governance and Business Sustainability*, Greenleaf Publishing, Broom Hall, (Sheaf), pp145-164.
Schmidheiny, S. (1994) 'Looking Forward: Our Common Enterprise', in Kolluru, R. V. (ed) *Environmental Strategies Handbook*, McGraw-Hill, New York.
Sheldon, C. (ed) (1997) *ISO 14001 and Beyond: Environmental Management Systems in the Real World*, Greenleaf Publishing, Broom Hall (Sheff).
Sterling, S. (1996) 'Education in Change', in Huckle, J. and Sterling, S., *Education for Sustainability*, Earthscan, London.
Strauss, B. H. (1996) *The Class of 2000 Report: Environmental Education, Practices and Activism on Campus*, Nathan Cummings Foundation, New York.
Thomas, I. and Olsson, M. (1998) 'Opportunities for Environmental Education Provided by Environmental Management Systems', *Australian Journal of Environmental Education*, Vol. 14, pp93-100.
Thomas, I., Kyle, L. and Alvarez, A. (1999) Environmental Education Across the Curriculum: A Process, *Environmental Education Research*, Vol. 5, No. 3, pp319-337.
Thomas, I., Kyle, L. and Alvarez, A. (2000) Introducing Environmental Literacy in the Tertiary Curriculum, *Australian Journal of Environmental Education*, Vol. 15/16, 1999/2000, pp95-101.
Thomas, I. and Nicita, J (2002) Sustainability Education and Australian Universities, *Environmental Education Research*, Vol. 8, No. 4 (forthcoming)
University Leaders for a Sustainable Future (2001) *History*, accessed 1 April, http://www.ulsf.org
University Leaders for a Sustainable Future (2002) *Talloires Declaration Signatories List*, accessed 23 May, http://www.ulsf.org
van Weenen, H (2000) Towards a vision of a sustainable university, *International Journal of Sustainability in Higher Education*, Volume 1, Issue 1, pp20. Available ProQuest Information and Learning Company [May, 2002].
Victorian Government (1987) *Protecting Our Environment—Victoria's State Conservation Strategy*, Victorian Government Printer, Melbourne.

Walton, A.E. (1995) Transformative Culture: Shaping the Informal Organization, in Nadler, D.A., Shaw, R.B. and Walton, A.E. (1995) *Discontinuous Change: Leading Organizational Change*, Jossey-Bass, San Francisco, pp151-168.

Wemmenhove, R. and de Groot, W. T. (2001) Principles for university curriculum greening: An empirical case study from Tanzania, *International Journal of Sustainability in Higher Education*, Volume 2, Issue 3, pp267-283. Available ProQuest Information and Learning Company [May, 2002].

Whiteley, A. (1995) *Managing Change: A Core Values Approach*, MacMillian, South Melbourne.

Wolfe, V.L. (2001) A survey of the environmental education of students in non-environmental majors at four-year institutions in the USA, *International Journal of Sustainability in Higher Education*, Volume, 2, Issue, 4, pp301-315. Available ProQuest Information and Learning Company [May, 2002].

Woods, S. (1994) *The Environmental Agenda, Taking Responsibility, The Built Environment*, Pluto Press, London.

Return to Contents

38. Getting to Grips with Sustainability and Environmental Best Practice: The Story of a Departmental Policy Process

Ingrid Timmermans

Rhodes University, South Africa

Keywords:
Policy in practice, tools for sustainability education, obstacles to change, recommendations for change

Abstract:
'EcoSonke' is a colourful and dynamic character that uses the concept of ecological footprinting to drive an environmental policy process at the Rhodes University Department of Education. This story will begin with what it means to have an environmental policy in the light of current sustainability debate. Rhodes University's campus environmental policy and the Department of Education's environmental policy will be used to consider both the educational value of an environmental policy development process and the challenges of implementing change in the interests of environmental best practice. EcoSonke's toolbox will be demonstrated together with a discussion of her successes and the many challenges ahead. These include dealing with the need for individual and institutional commitment and a range of technological, logistic and financial difficulties. Lastly, recommendations will be made for improving the success of the policy process within the broader institutional framework of the university.

Introduction

Rhodes University is a signatory to the Talloires Declaration, which commits universities to environmental management and sustainable development. The paper reflects on the commitments Rhodes University has made in terms of working towards a more sustainable future. This story will show how Rhodes University has used these commitments as a scaffolding on which to develop its own policy and has made its own unique contributions to the meaning of sustainability through the development of its campus policy.

An important aspect of a policy is a strategy for its implementation. This is the challenge that was faced by the Rhodes Department of Education, which aimed to begin enacting some of the objectives laid out in the Rhodes policy. 'EcoSonke' is a colourful and dynamic character using the concept of ecological footprinting to drive the environmental policy process in the Department of Education.

This story begins with what it means to have an environmental policy in the light of current sustainability debate. The Department of Education's Environmental Policy is used to consider both the educational value of an environmental policy development

process and the challenges of implementing change in the interests of environmental best practice. The paper considers processes of initiating change as individuals and as an organisiation, in the context of South Africa and a broad notion of sustainability with its implications for social and environmental identity.

Finally, recommendations are made for improving the success of the policy process within the broader institutional framework of the university.

Environmental Commitment on Campus

Rhodes University is one of 22 universities internationally to have signed the Talloires Declaration. This declaration commits university leaders to environmental management and sustainable development. The Talloires Declaration text states that:

> Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature. Universities have a major role in the education, research, policy formation and information exchange necessary to make these goals possible" (International Association of Universities, date unknown).

This statement is most useful in identifying the areas in which a university should be considering sustainable development, that is education, research, policy and information exchange. The intended actions in the declaration seem to focus on the development and education of others but do not suggest that universities should be looking at their own environmental practice. In the Rhodes University Policy one can find, in addition to these actions, the notion of 'environmental best practice', which through the objectives of the policy, is clearly extended to the campus itself. This is an important addition to the roles of Talloires Declaration signatories, as a university can only rightfully comment on the practice of sustainability in the wider community when it has faced similar challenges on its own campus.

Guided by principles, responding to shifting needs

Many of the proposed actions of the Talloires Declaration are aiming towards a 'sustainable future'. Rhodes University uses similar language in its policy, that is a goal to “actively pursue a policy of environmental best practice in order to assist in creating an environmentally sustainable future” (Rhodes University, 1997). Both ‘environmental best practice’ and ‘an environmentally sustainable future’ are terms open to a wide range of interpretations. Potter (1997, 147) considers how the concept of sustainability has become a phrase engendering a definite 'feel-good' factor, but questions that to have any meaning, a consideration of sustainability must include a consideration of 'what is to be sustained'.

Through a careful consideration of the principles, which underlie policy formation, one can begin to clarify what exactly is meant by the terms 'sustainability' and 'best practice' in associated goals and mission statements. Not only will such consideration enable clarification of an agenda, but also it will be essential for establishing meaningful sustainable practices. This need for guiding principles is supported by Roome and Oates (1996), who state that 'sustainability will require the development of businesses that are self-regulatory and constrained by principles'.

Neither the principles of the Talloires Declaration nor the Rhodes Environmental Policy are made explicit, but one sees evidence of underlying principles such as a concern for 'equity' in the former and a commitment to involvement in the local community in the latter. Environmental policies could well benefit through encouraging dialogue and making explicit the values that underlie and inform their actions. A facilities management booklet by Simpson (2001) from the University of Buffalo's 'Green Office' contains an example of the kind of dialogue in which universities should be engaging. Simpson questions the commercial culture of many American Universities and calls for dialogue about 'cultural change' (Simpson, 2001, p 20). Later in the paper, I will discuss how the Rhodes Department of Education Environmental Policy has created dialogue and a need for change in terms of its corporate image which makes 'environmental best practice' difficult.

Guided by principles one can begin questioning what needs to be sustained and from whose perspective best practice is considered. This can assist with the formulation of aims and objectives, and planning of practical outputs for achieving these aims can begin. Carpenter & Meehan (2002, 30) consider the importance of developing such plans, which 'facilitate the development of management infrastructure, facilitate accountability and foster participation and representation'.

Having a plan, though, does not mean having an inflexible 'mega plan' which lays out all the activities for an extended period. The Education Department's environmental policy working group discusses plans and the success of their implementation at regular meetings, which are documented and shared, with the rest of the staff. The department's policy operates as an open-ended and responsive process such as recommended by Roome and Oates (1996, pg 169) comment that sustainability requires flexible, responsive, diverse and devolved organisational forms. They highlight

> '… the importance of a learning mindset in which staying attentive to the shifting needs of society and the dynamics of environmental change will be as important as staying close to the needs of customers. It requires an approach that questions the adequacy of the organisation's knowledge, understanding, practices and values so that these are (re)shaped as part of increasingly sophisticated and thoughtful responses to the interconnected concerns we face'.

Resource use and ecological footprints

The Department of Education's environmental policy is guided, but not limited by the Rhodes environmental policy. The department has for some time had a strong focus on environmental education in many of its courses and hence has already been responding to the environmental teaching and research aspect of the university policy. The Department's associated Rhodes University Environmental Education Unit (RUEEU) has responded to local environmental issues through the development of educational materials on waste, and water and hygiene, and is currently working with a group of teachers in identifying issues of concern in their schools and communities. Teachers are supported in responding to these issues through the development and implementation of a school environmental policy and the integration of environmental learning in their teaching practices.

In addition to these initiatives, the Education Department is implementing its own environmental policy, which focuses on our specific departmental impact on the environment. We have used the metaphor of an ecological footprint to encourage staff and students to consider their environmental impact, focusing primarily on issues of resource use. If you visit the department, you will find brightly coloured footprints pasted up around the buildings and a character called EcoSonke who was developed to represent the environmental policy. EcoSonke is a concerned environmentalist with a penchant for growing very large feet when her ecological impact becomes too great. She and the brightly coloured footprints have become the recognized messenger and symbol synonymous with the environmental policy. In the foyer you will find a poster for keeping staff alert to environmental management issues in the department. These are all part of our environmental policy, which we began implementing in March 2000.

EcoSonke

So as to rally the support of all staff for the environmental policy, we have tried to ensure that the policy process has encouraged the participation of all staff. Another important feature of the process has been an educational focus, which aims to ensure that we have informed participants contributing to the process.

A process of information seeking, monitoring, action and reporting

There are a number of elements of an environmental policy that enable an informed participatory process. These elements - finding information, monitoring, taking action and reporting - are illustrated below

Finding and sharing information

The first step in the departmental environmental policy process was to gather information about particular aspects of the department that might impact on the environment. Staff members were asked to identify which issues they felt left the biggest mark on the environment. More information was then sought about the issues identified. These issues were water, paper, energy, office equipment (including radiation and ergonomics), stationery (including the toxicity and sustainable options of stationery), and the work environment (including aesthetics, the kitchen, consumables and 'sick-building-syndrome').

Information was collected through library and internet searches, from environmental organisations dealing with issues such as recycling, from businesses to follow up on sustainable purchasing options, and from other Rhodes University departments such as computer science and electronics for more technical information. This information is filed in an environmental policy file.

Information gathering is an ongoing process and as investigations have begun in our local context and as action plans have been implemented in response to some of the issues identified, we have needed to contact different people for more information and to delve deeper into issues as questions arise.

Monitoring

Monitoring is an important role played by the policy task team. A few education staff members and a student form an environmental policy task team, who help to drive the policy in the Department. For example, the team needs to follow-up on whether paper recycling boxes are being used, used for the right purposes, and emptied before they become too full and unsightly; and whether the paper at the central collection point is being regularly collected. If an initiative is badly managed and becomes a burden to people, it is very easy to lose their support and co-operation.

Taking Action and Reporting

The task team makes decisions about how to tackle identified issues and sets about implementing those plans. There are a number of dimensions to the policy for recording our activities and research, and for motivating the staff and keeping them informed and involved in the progress of the environmental policy:

1. Environmental Policy File

A file is kept in the post room with contact details, information gathered, records of actions taken and working group minutes.

2. An Environmental Policy Display
This is a display in the foyer consisting of a laminated 'map' of the department around which information on the progress of environmental initiatives is recorded. Action plans are attached to this poster and then filed in the Environmental Policy File once successfully implemented. This display also has a sheet of paper on which staff can make comments or suggestions for the working group to follow up.

3. Footprint 'Hot Spots'
Particular spots in the department have been identified which are potentially areas where people may need reminding to switch off lights and equipment, for example. These spots are marked with a brightly coloured laminated footprint and a short reminder.

Paper hotspot: Signs are stuck onto normal bins when we find paper in them that should have been recycled

4. EcoSonke Says
The policy task team also keeps staff informed through *'EcoSonke Says*'. This is a regular posting on the Environmental Policy Display with short pieces of information related to action plans in process or ideas for reducing our ecological footprint. *EcoSonke Says* is also e-mailed to all staff.

Opportunities and Challenges

Cutting down on resource use
To date we have addressed issues associated with paper, energy, water and stationary use. Boxes for one-sided paper have been placed in all the offices for re-use. The one-sided paper that is not used is sent to local pre- and primary schools. Non-reusable paper is sent to a local Grahamstown recycling company. We have been collecting about one ton of paper per year in the Department. Although the money obtained from our recycling is minimal, it is enough to make small contributions to improving our office environment, for example, we bought a cycad for the gardens outside the Department with our first payment. We are now trying to establish a policy using recycled paper for letterheads and publicity flyers for the Department. We have also established a system for collecting printer cartridges for recycling and are investigating the use of remanufactured/ compatible cartridges in our printers. We are trying out small energy saving initiatives by

looking at how different appliances use electricity, and by strategically placing reminders to switch off lights. In the immediate future we hope to address issues such as the recycling of plastics, cans and glass.

Having an environmental policy creates an awareness and preparedness in the Department that enables us to respond to issues as they arise. For example, when a toilet cistern cracked in the Department recently, we specifically requested a regulated flush cistern to replace it. Without our heightened awareness a more environmentally conscious option may not have occurred to us at all.

Can we make a difference?

Although most staff members are supportive of our initiative, small changes in habit seem hard to make. Staff members have questioned small, proposed initiatives to reduce our environmental footprint. For example, if we switch off the passage lights overnight in the department or if we boil an adequate half urn at tea instead of a whole urn, will we make a significant reduction in the amount of electricity we use? Certainly, financially, such a small amount of electricity *might* be negligible, yet shouldn't we also be considering the principle behind cultivating a culture of care and respect for resources?

Environment in a developing country

In South Africa we do not have a culture of recycling as is evident in many northern countries. This was particularly evident in the difficulty we had in encouraging staff members to use the recycling bins provided. Despite repeated pleas and reminders, we still found that the majority of rubbish collected from the 'normal rubbish bins' was paper. We responded by putting small green 'Thank you for recycling' cards on all the bins in the department. Any staff member who has paper found in their bin has this card replaced by a red reminder card. We are pleased that this system seems to have made a big difference and has radically reduced the amount of paper thrown out with the general rubbish.

It is also important to consider the context in which these initiatives are occurring. In South Africa, many of our environmental issues are more pressing problems associated with poverty, unemployment, AIDS/HIV, inequality and the meeting of basic human needs. In this light, small resource-use initiatives can seem even more insignificant.

One area beyond resource use to which we have been able to make a small contribution is the issue of HIV/AIDS. The policy working group has taken the responsibility of organizing condom dispensers for the student toilets and makes sure that the dispensers are regularly replenished.

A call for organisational change

Besides at an individual level in the Department, we also experience problems at an organizational level. We have identified a need for organisations to revisit polices and traditions and to reconsider prejudices in the interest of our environment. For example, the Rhodes University Environmental Education Unit was criticised for using recycled paper for its letterhead because the chosen recycled paper was not 'white' enough to

comply with Rhodes's 'corporate image' - plain white virgin paper. Eventually we compromised on a very expensive, but whiter, imported recycled paper. We were not happy with this paper, as it is imported and expensive (at last pricing 59c/sheet). Besides the cost implications, imported paper is not particularly environmentally friendly when we should be supporting our local South African industries and encouraging them to invest in more research and new recycled products (driven by our demand for them). Carpenter and Meehan (2002) acknowledge that recycling industries may be at an early stage of development, which may mean that some time elapses before we see a return on our investment in more environmentally, but less cost-effective products. Our preferred paper for our letterheads is more cost effective than the approved recycled paper (although still slightly more expensive than plain white p aper), is locally made and is not chlorine bleached nor de-inked.

Roome and Oates (1996, pg.165) comment that there are many companies that are involved in a process of improved environmental performance, but few have considered this performance in the light of the broader notion of sustainability. To consider the broader notion of sustainability means a 'profound examination and change of its social and environmental identity, its purpose and its practices'. A reconsideration of Rhodes's corporate image will be a beginning in terms of changing our identity. The recommended participation by Rhodes in the Grahamstown Integrated Development Plan (IDP) as discussed below will have a positive impact on Rhodes's social identity (this is not to undermine many of the important socially uplifting projects that Rhodes is and has been involved in to date).

The issue of changing identity is considered in Carpenter and Meehan's (2002, pg.31) discussion on the importance of business plans. They comment how business plans often focus on the financial benefits of a programme. However, for example, at the Australian National University

> the assessment of return on investment has been broadened to take into account the negative impact of inaction in the university's reputation … The important thing is for managers to substantiate the project in real financial, social and environmental terms.

Another organisational problem experienced with recycling at Rhodes was with our attempt to recycle printer cartridges. The Rhodes Department of Electronics discontinued a system it had of donating all of the university's old printer cartridges to a recycling company because the cost of the courier outweighed the price received for the cartridges. After many phone calls and after being let down by two organisations that repeatedly promised to collect cartridges, the Department of Education eventually found a company willing and able to collect its cartridges at no cost. We would still like to encourage the Electronics Department to reestab lish its recycling initiative using this same company.

Recycling initiatives are better established in larger South African cities such as Cape Town and Johannesburg, but the cost of transporting recyclable material to the recycling plants from small, more remote towns such as Grahamstown is often very high. This

highlights the need for Rhodes University to establish working recycling initiatives involving all departments and ideally also the local municipal council through participation in Grahamstown's IDP. Recycling on a larger scale may make these initiatives more financially viable in terms of transport and equipment. We have found recycling companies particularly willing to negotiate better prices with us when they know we come from a large organisation that can potentially generate a lot of business for them. More cooperation in Grahamstown may also provide opportunities to process recyclable materials further such as through the purchase of a shredder for garden refuse or a plastics baler.

Technological challenges

We have also been faced with technological challenges during the initial phases of policy implementation. For example, we feel that if we genuinely want to support the recycling of printer cartridges, we should be using recycled cartridges ourselves. Yet research and experience at the university has revealed that refilled inkjet cartridges are notoriously unreliable and result in costly repairs to printers when they leak. Thus for the time being we have been given the blessing of the Department of Electronics (who repair our printers) to experiment with using recycled cartridges on one of our LaserJet printers, but we have had to abandon the idea of using recycled inkjet cartridges. That is until we have some indication that technology in this field has improved.

Another technological shortcoming is the lack of a suitable, economically viable recycled paper to use for the copying of student notes. The only recycled paper that is economically viable for this purpose is a paper that utilises chemicals for the deinking process and bleach for whitening. The paper is also not of a high enough quality to be run through high speed copying machines. Paper making companies argue that their normal bond paper is environmentally friendly because it is oxygen bleached and because they re-use the water from the paper making process. Yet this does not address the many hectares of indigenous grasslands that are ploughed up and replaced by plantations nor the large amounts of water used by these plantations -a big problem in a water scarce country such as South Africa.

Recommendations

Although Rhodes University has achieved many of the environmental policy objectives to date, the problems experienced by the Education Department in implementing some of its initiatives indicate that greater success could be achieved through the mainstreaming of environmental management at Rhodes. Carpenter & Meehan (2002) discusses some of the considerations for mainstreaming environmental management: developing environmental plans, allocating appropriate resources, conducting environmental auditing and reporting, and encouraging community involvement.

Rhodes's intention to encourage the last point - community involvement - is evident from the environmental policy, which indicates a commitment to involvement at a local level including interaction and communication with local community individuals and organisations. The above discussion has indicated that an integrated response by the

whole community has a greater financial viability and can more effectively respond to issues through cooperative programmes. I see the opportunity for Rhodes University to make that commitment to community involvement through supporting recycling in Grahamstown. That commitment could be purely advisory through participation in the Grahamstown IDP, structural through the provision of space for recycling bins and sorting and processing of recyclable materials, and/or financial (contributions which could ultimately be recoverable) through providing capital for bins and processing equipment.

Rhodes could also show its commitment to mainstreaming of environmental management through the allocation of more resources (financial) for addressing environmental concerns. Some ideas for where additional funding could be considered are drawn from Carpenter's (2002) study of the Australian National University

- Subsidise the purchase of more environmentally friendly products eg. recycled paper
- Help students with environmental projects
- Employ students to carry out environmental audits
- Fund student and staff environmental activities
- Fund an environmental achievement award
- Engage consultants to carry out environmental risk assessments

The commitment to enable the kinds of recommendations discussed above (and these are but a few of the possibilities) can be best enacted through the appointment of a dedicated staff member to respond to environmental issues on campus. Such a person would also be able to fully participate in community environmental initiatives such as Grahamstown's IDP. Although Rhodes University has appointed a person to be responsible for the policy, this person already had a full-time commitment before the appointment. To expect a person to meet the challenge of making a genuine difference for the environment in addition to holding another portfolio can potentially undermine both portfolios.

Simpson (2001) comments on the importance of top management support. He states that:

> policy implementation will be expedited, go more smoothly and be more comprehensive and effective if top campus management is interested, on board and involved and sets the right example by practicing green habits. If top management shuns green habits, these habits may be viewed as unprofessional or eccentric, and institutionalising them will be impossible.

This is enforced by Carpenter and Meehan (2002, pg.19) who say that 'if environmental programmes are to succeed, they must be mainstreamed into university operations, rather than sidelined as a soft management issue'.

Conclusion

The implementation of environmental policy is and will probably continue to raise questions of financial, ecological and social sustainability, and will no doubt be dependent on individual and inter-departmental co-operation, and with a need for change of heart and habit.

We hope that the story told here will be an incentive to other Rhodes departments to take on the challenge of both implementing their own environmental policies and working with other departments to create a 'whole campus' response to environmental issues in Grahamstown. Other Rhodes departments can draw on available experiences, tools and information gathered so as to inform and streamline their responses to similar problems. It is hoped that this story will have highlighted the need for ma instreaming environmental management at Rhodes University especially in terms of commitment of resources such as personnel and finances. To demonstrate genuine commitment to developing sustainable environmental practices, Rhodes University will need to reconsider its social and environmental identity in terms of its corporate image and commitment to local community processes.

References

Carpenter, D. & Meehan, B. (2002), "Mainstreaming Environmental Management: Case Studies from Australasian Universities". *International Journal of Sustainability in Higher Education*, Vol.3 No.1, pp.19-37.

International Association of Universities. (Date unknown), *The Talloires Declaration*. http://www.unesco.org/iau/tfsd_talloires.html

Potter, J. (1997), "Sustainable Development: Are we being Conned?" *The Environmentalist*, Vol.17, pp. 147-148.

Rhodes University. (1997), *Rhodes University Environmental Policy*. http://www.ru.ac.za/environment/

Roome, N. & Oates, A. (1996). "Corporate Greening". In J.Huckle and S. Stirling (Eds) *Education for Sustainability*, Earthscan Publications, London. pp. 165-180.

Simpson, W. (2001). *Environmental Stewardship and the Green Campus: The Special Role of Facilities Management*, UB Green Office, Buffalo.

Return to Contents

39. Institutionalisation of Sustainable Development: The University of Antwerp

T. Waas and M. Sys

Introduction

Many universities and institutions of higher education signed a charter or a declaration on sustainable development. To date 303 institutions signed the COPERNICUS Charter (COPERNICUS, 2002) and 288 signed the TALLOIRES Declaration (ULSF, 2002b).

By signing the charter(s) the institutions declared to implement sustainable development. Although this is in itself an important step towards implementation it falls short and real efforts of the institution (such as the provision of financial resources, personnel) are needed to implement the required changes. Furthermore, a truly sustainable institution should embed the required changes and initiatives in the institution. Institutionalisation is required.

How we try to institutionalise sustainable development at the University of Antwerp is addressed below, taken into consideration different aspects of change management. We also discuss the unique opportunity the highly dynamic change process at the University of Antwerp seem to offer for the institutionalisation of sustainable development, the deliberate selection of key persons throughout the university community for the participation in a project team and different working groups and the definition of sustainable development which could be strategic at our university.

It is important to notice that we will use terms as sustainability, sustainable and sustainable development interchangeably. They all refer to the concept of sustainable development.

The University of Antwerp: an institution in change

Formatted

Situation

The University of Antwerp has a confederal structure and consists of three institutions: RUCA (Universitair Centrum Antwerpen), UFSIA (Universitaire Faculteiten Sint-Ignatius Antwerpen) en UIA (Universitaire Instelling Antwerpen). Until recently all three institutions were independent universities in Antwerp. Indeed, in the past there was complementarity and competition between the courses of the different institutions. An example of this competition is the course Applied Economics, which was lectured at RUCA and UFSIA.

Each institution still has its own rector. The Rector-Chairman who is elected from one of the three constituent institutions chairs the Confederal University of Antwerp.

In 1852 the two educational institutes, which grew into the institutions of RUCA and UFSIA, were founded. The UIA is the latest institution, founded in 1971.

Each institution has its own traditions and culture (Universiteit Antwerpen, 2000). Those traditions and cultures originate among other things from the ideological inspirations of the three institutions. UFSIA has a Christian inspiration; RUCA and the UIA are pluralistic.

At present, the Confederal Univerity of Antwerp – as from now the University of Antwerp, briefly UA – puts in great effort for the further integration towards a united university 'the University of Antwerp'. Full integration is expected in the next years (2004).

The different traditions, the different organisational cultures, the mutual relations of complementarity and past competition between the institutions is currently brought together to bring the three institutions to a full integration.
This full integration involves the integration of certain faculties, certain departments, administrations and various geographic relocations.
Therefore, the UA is currently undergoing a highly dynamic and far-reaching change process.

Some data Formatted

The UA has almost 10000 students and about 2500 employees. The UA consist of eight faculties: Faculty of Arts, Faculty of Language and Literature, Faculty of Pharmaceutical – Biomedical and Veterinary Sciences, Faculty of Political and Social Sciences, Faculty of Medicine, Faculty of Laws, Faculty of Applied Economics, Faculty of Sciences (including biology, biochemistry, physics, chemistry, informatics, mathematics). The UA also has a hospital.

Sustainable development at the University of Antwerp

Field of application

The UA is planning to implement sustainable development in education, research and management. The management encompasses all services and activities of the university that are necessary to carry out her research and education tasks. Among other things, the management includes the human resource management, the student social service, the environmental and safety service, the technical service, and the financial service.

Definition of sustainable development at the University of Antwerp: a strategic issue?

To implement sustainable development at the UA we consciously choose to interpret sustainable development in the three dimensions of sustainability.

These dimensions are: an economic dimension, an ecological (as from now environmental) dimension and a social dimension, integrated by sustainable development (Hens, 1996).

We have the impression that sustainable development at universities often is solely focused on the environmental dimension of sustainability.

The conception of sustainable development in the three dimensions does not mean that we cannot or will not stress environmental objectives. On the one hand because sustainable development stresses the interdependence between economic growth and environmental quality (Welford, 1998), on the other hand because of the current pressure by man on the environment.

Further, we notice that the central role of the environment in sustainable development has grown historically because the term 'sustainable' arose among those with environmental concerns (Clugston and Calder, 2000). Nevertheless sustainable development is, mentioned above a concept, which should be interpreted in a broader way than merely in terms of environmental objectives.

An institution that implements sustainable development should address social considerations (Clugston and Calder, 2000) together with the economic and environmental objectives of sustainable development.

> ""Sustainability" implies that the critical activities of a higher education institution are (at a minimum) ecologically sound, socially just and economicaly viable, and that they will continue to be so for future generations. A truly sustainable college or university would emphasize these concepts in its curriculum and research, preparing students to contribute as working citizens to an environmentally sound and socially just society." (ULSF, 2002a)

In addition there is probably at the UA a strategic reason to choose for the integration of the three dimensions of sustainability. A strategic reason which could be important for the institutionalisation opportunities of sustainable development at the university.

We strongly assume, based on some data (informal talks with those involved) appearing during the implementation process, that because of this conception of sustainable development people of the university community feel more addressed by sustainable development than would be the case when defining sustainable development only as an environmental issue. Apparently people reacted positively when we told them that on the one hand sustainable development contains more than environmental issues and that on the other hand it is our strategy to implement and finally realise the full integration of the three sustainability dimensions at the UA.

This together with the high interest of key persons involved, which have more affinity with social issues, makes us believe that there is a strategic reason at the UA for using the 'three dimensions definition'. The high interest is shown by the entry to the Project Team Sustainable Development (PTSD) and the working groups – a detailed discussion on those organs follows below – founded and by their presence on the meetings. All the more because they participate on voluntariness and they are all very occupied persons.

Because of all those positive reactions we expect an increase in support for sustainable development within the UA.

Further, sustainable development is frequently misconceived as too abstract and too distant from reality, because of the scope and partly because of lack of information.

Such a misconception is usually translated in a negative perception of sustainable development, which in its turn usually results in a lack of willingness of an institution to implement it (Filho, 2000). Therefore it is important to translate sustainable development into concrete themes to make everybody understand what it is all about and to create more support for it.

At the UA we had the advantage that some of the education and research projects in the university address themes of sustainable development (i.e. themes of Agenda 21). Also several institutes and centres of the UA address themes of sustainable development in their research and education. Among others the Institute of Environmental Sciences, Institute of Development Policy and Management, Study Centre of Gender Studies, Study Centre Technology, Energy and Environment.

Through the existence of themes of Agenda 21 at the UA, persons and key persons of the university have feeling with those themes and usually through that with the issue of sustainable development. The existence of the themes makes sustainability less abstract at the UA, which seems to result in a positive perception and a willingness to implement.

The change process at the University of Antwerp: an opportunity for the institutionalisation of sustainable development?

Sustainable development demands change

The implementation of sustainable development at the UA and at universities in general to some degree demands change. The change required is not a single change but a continual flow of changes.

As sustainable development is a dynamic concept, ever changing and never final resulting from the ever changing and evolving society with changing needs (Vanderborght, 1996). Sustainable development and the implementation of it within organisations is a long journey but never a final destination. Given the dynamics of sustainability a university or any other organisation should be continually receptive for change to implement sustainable development.

Another thing is that universities are of the most conservative type of organisation (Altbach, 1999), which makes it difficult to implement change.

"Universities and colleges that have existed as institutions for many years […] tend to be fiscally and operationally conservative. […] Although by virtue of their role as research institutions, some thinking at colleges and universities is innovative and experimental, but little seems to rub off on the institutions themselves, which are often run much the way they have been for years. " (Creighton, 1998)

However this does not mean that universities are unchangeable. Even at universities change takes place (Allen, 1999)

"Institutions do change, even the 'Ivory Tower' of academia." (Allen, 1999)

Opportunities for institutionalisation Formatted

As already mentioned the UA is undergoing a highly dynamic and far-reaching change process. The current change process seems to offer a unique opportunity for the institutionalisation of sustainable development:

- To make sustainable development explicit in the mission statement of the UA.
  The UA currently prepares a new 'UA Mission Statement" within the framework of the integration. This offers an opportunity to explicitely put sustainable development explicit in the mission statement of the university.
  In the present proposal of the mission statement that is submitted for approval sustainable development is made explicit. This is an important point for the further institutionalisation of sustainability at the UA as a mission statement is imperative to provide the impetus and justification for change (Allen, 1999).

  Members of the Project Team Sustainable Development and the different working groups stated several times:

  "If they [being the 'top' of the university] find sustainable development so important than they should also do something for it and invest into it"

- Embedment of sustainable development in the new organisation structure of the UA.
  The integration of the UA necessarily leads to a new organisation structure. The required changes offer an opportunity for the embedment of sustainable development in the new organisation structure, such that sustainable development becomes an integral part of the organisation structure of the university.

  "The result of true institutional change cannot be an 'add-on' to the existing structures; it must be an integral part of the institution" (Allen, 1999)

The implementation of sustainable development at the University of Antwerp: a strategy of institutionalisation

Given the opportunities of the current change process at the UA, we particularly aim at the institutionalisation of sustainable development in the university.

If we want sustainable development to be embedded in the university, a full institutionalisation is required.

To achieve this aim we take into account the aspects of change management (table 1).

Table 1: Aspects of change management in higher education

• **advocacy** is the impetus to begin the change movement • **policy** adressing the proposed change(s) is required

- **resources** for the change movement are imperative
- **leadership** is the key for a succesful change movement
- well-defined **means** to achieve-agreed upon **ends** are important for succes
- **education** in and out the classroom for students and employees is the primary mean and end

Source: Allen, 1999

Hereafter we give an overview of the milestones in the process towards institutionalisation of sustainable development at the UA.

Signing of the COPERNICUS Charter

The UA signed the COPERNICUS Charter (The University Charter for Sustainable Development) in 1999. This subscription resulted from the personal interest of the Rector-Chairman and the interest of the Institute of Environmental Sciences of the UA.

This commitment shows the willingness and the engagement of the UA to contribute actively to sustainable development.

The commitment of the university top management is an important factor that enhances the probability of success of the implementation of sustainability initiatives (Clugston and Calder, 2000).

External funding Formatted

To further implement sustainable development at the UA the academic board started up a research project 'Implementation of sustainable development at the UA'. Therefore funding was needed. External financial resources were found in the year 2000 by reorienting an external financed research budget. The greater part of the available financial resources is used to pay the wage of the appointed research fellow until 2003 (full-time).

Although the acquisition of external funding for the implementation process is very valuable in the beginning of the process, internal financing is required to achieve permanent institutionalisation of the changes (Allen, 1999, Keniry, 1995).

"Campuses have dismantled several exemplary programs when outside funding expired." (Keniry, 1995)

Internal financing is essential if sustainable development is to be truly and permanently embedded in the UA.

Start-up initiatives

During the first working year, this is until the appointment of the research fellow a lot of valuable start-up initiatives were realised.

Those initiatives were accomplished by the Institute of Environmental Sciences to sensitise the academics and other interested people on sustainable development. For example the Chair 'environmental education' was reoriented towards 'education for sustainable development'.

Nevertheless those initiatives were rather situated at the 'edge' of the UA as an organisation.

We could say that those initiatives are 'valuable edge activities', the initiatives and as a consequence the sustainability movement does not penetrate into the core of the UA as an organisation. Therefore we can by no means state that sustainable development was institutionalised at this starting point.

A scientific basis

Prior to the involvement of key persons in the project of sustainable development and before we made recommendations for the concrete implementation of sustainable development, we accomplished a literature review. The literature review gives an academic basis to the implementation proposals and therefore builds up academic credibility.

If the sustainable development initiatives lack academic credibility, they will be rejected (Clugston and Calder, 2000) because of the academic environment we are in.

Foundation of a Project Team Sustainable Development and working groups

The first initiative for the institutionalisation of sustainable development at the UA and also the first visible initiative within the framework of the research project was the foundation of the Project Team Sustainable Development (PTSD). Up until now the PTSD is an 'informal' organ because it is not embedded in the organisation structure of the UA. To make the link with the 'formal' organisation the implementation proposals made by the PTSD will be submitted for approval to the Rector-Chairman and by way of the Rector-Chairman to the Executive Board UA. This makes the link to the 'formal' decision power of the UA. The advantage of the involvement of the Executive Board UA is that the top management of the UA supports the approved proposals.

The 'informal' organisation structure and the link to the Rector-Chairman and the information flow between the organs – which will be discussed later – are presented in figure 1.

The PTSD meets at minimum twice a year.

At the first meeting of the PTSD it was decided to found three working groups (also 'informal' organs):

- working group sustainable development & education;
- working group sustainable development & research;
- working group sustainable development & management.

The PTSD and the working groups, both based on voluntariness were founded to achieve the following aims:

1. *Access to policymakers, to decision power*

   Through the fact that sustainable development is not yet institutionalised in the UA we felt the need for contact with policymakers and the power of decision

of the university. This to proceed to the implementation of sustainability, in particular the institutionalisation of it.

Decision power or access to policymakers is imperative for implementing change. Without the power to make change or protect changes once they have occurred, change fails. Unless the support for the changes is so widespread in the organisation that some centralised power is unnecessary (Allen, 1999). The fact that the implementation of sustainable development is a research project we and as a consequence the 'core' of the sustainability movement is situated on the 'edge' of the university.

Particularly the PTSD delivers access to policymakers and decision power.

2. *Access to information about developments at the UA in general and particularly about the change process*

To keep us informed about the organisational developments and the change process and because we are at the 'edge' of the UA we felt the need for information.

In order to close this information gap we needed contact with policymakers. This is important because we deliberately want to fit in the on-going organisational developments and priorities of the UA. The different opportunities for institutionalisation urge this need.

3. *Informing policymakers about the implementation of sustainable development*

To fit in the organisational developments it was important to inform policymakers about the implementation of sustainable development at the UA.

As a result policymakers can link the acquired information about the implementation of sustainable development to other organisational matters.

4. *Participation of key persons of the university community*

A university-wide committee can help institutionalise environmental initiatives and brings together different stakeholders. (Creighton, 1998).

The same can be said about sustainability initiatives. A committee or a team or working groups with representation of the university community brings different stakeholders together.

Because stakeholder participation is an integral part of sustainable development (Welford and Jones, 1998) it is de facto part of the implementation of sustainable development at universities.

Participation also increases the involvement of key persons and can – as with environmental initiatives – help the institutionalisation of sustainable development. Further more we create more support for its implementation.

Key persons throughout the whole university community were invited to participate in the PTSD. To date only students – though invited – are not yet represented in the PTSD. This is a shortcoming that will be addressed at the start of the next academic year. On the other hand students already participate in the working groups.

5. *Bottom-up approach*

The bottom-up approach is accomplished by generating proposals for the implementation of sustainable development in different working groups, each in function of their field of application. The creation of support and the use of the expertise of the participants are the primary aims of this bottom-up approach.

6. *Sensitisation*

Through the active participation in the PTSD and the different working groups members are sensitised on sustainable development and the goal of the implementation of it at the UA. Thanks to the deliberate selection of the team members we are sensitising the policymakers of the UA.

Indeed education about the change agenda, implies a decrease in the resistance to change and consequently increases the chances of success (Allen, 1999, Allen, 2000, Keuning, 1998).

7. *Leadership*

The members of the PTSD give broad leadership to the implementation of sustainable development.

Those responsible for the implementation of sustainable development should be supported by broad leadership (Allen, 1999). Such a broad leadership is an important aspect within the most successful change initiatives (Keniry, 1995).

The support and the participation of key persons emphasize the importance of sustainable development for the UA and most probably increase the realisation possibilities of the change agenda.

8. *Obtaining expertise*

The members of the PTSD through their deliberate selection and the working groups supply expertise with regard to:

- sustainable development in general and the economic, environmental and social dimension more specifically;
- education, research and management;
- the organisation (culture, sensitivities, habits, …).

Composition of the Project Team Sustainable Development

To achieve the above-mentioned aims the members of the PTSD were deliberately chosen throughout the university. The following criteria were used:

- key persons of the different groups of the university community (professors, administration, students);
- expertise concerning the economic, the environmental and social dimension of sustainable development;
- expertise concerning education, research and management.

Due to the current situation of integration at the UA it was also important to have representatives of the three institutions (RUCA, UFSIA, UIA) and the Confederal University of Antwerp in the team. A fourth selection criterion was used:

- representation of the three institutions (RUCA, UFSIA, UIA) and the Confederal University of Antwerp.

Most of the selected persons reacted very positively and confirmed their participation in the PTSD. Among others members of the team are: Rector-Chairman – represented by the Senior Administrative Officer Research UA, Rectors, Heads of Administration, different experts). In total the team has currently 17 members.

Tasks of the Project Team Sustainable Development

The PTSD has the following core tasks:

- evaluation and approval of the yearly proposals addressed to the Rector-Chairman;
- follow-up of the yearly implementation plan;
- if necessary adjustment of the yearly implementation plan.

The PTSD currently has a central function in the implementation process of sustainable development at the UA.

Situation of the working groups for education, research and management

We founded working groups for each field of application.

The task of the working groups is to work out concrete proposals for the implementation of sustainable development in the different fields of application, education, research and management. Then the proposals for the implementation are presented to the PTSD. We can consider those working groups as brainstorming panels.

In spite of the fact that concrete proposals for implementation will be domain specific, we try to obtain cohesion by selecting a year theme identical to each working group and let the working groups work together on that theme. We aim for as much synergy as possible between the groups with regard to the year theme.

Information flow

To obtain a good flow of information between the PTSD and the working groups the chairmen of the working groups were chosen among the members of the PTSD.

The Coordinator of the research project sustainable development and the Research fellow of the research project sustainable development reinforce the flow of information between those organs.

The flow of information between the different working groups is obtained by the participation of the Coordinator of the research project sustainable development and the Research fellow of the research project sustainable development in the three working groups.

The Coordinator of the research project sustainable development and the Research fellow of the research project sustainable development are responsible for the communication with the Rector-Chairman.

The above described information flows are depicted in figure 1.

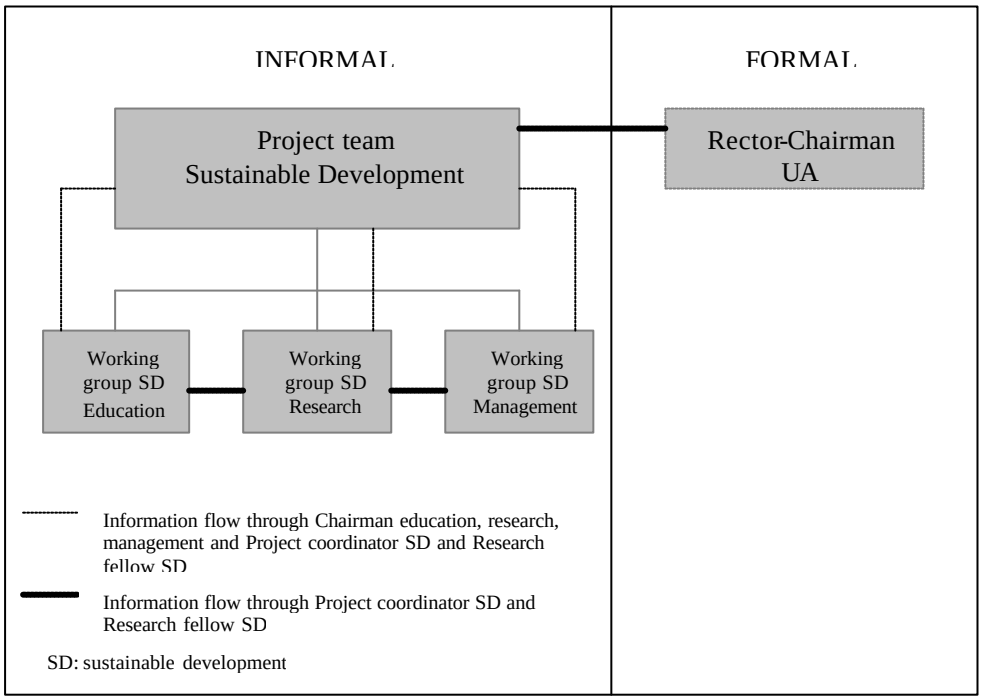


Figure 1: 'Informal' organisation structure and the information flow within the 'informal' structure and between the 'informal' structure and the Rector-Chairman

Conclusion

To implement sustainable development at the UA we consciously choose to define it as the integration of economic, environmental and social (including culture) considerations. This because of the following considerations:

- sustainable development stands for this definition, which a truly sustainable institute should follow;
- it appears that through this definition people feel more addressed by sustainable development than would be the case when sustainability is defined only as an environmental issue.

Further, it is important to translate sustainable development in concrete themes to obtain a positive perception and to create more support.

The current dynamics in the integration process of the UA seems to offer some unique opportunities for the institutionalisation of sustainable development: making sustainable development explicit in the mission statement of the UA and the embedding of sustainable development in the new organisation structure of the UA. Both are key developments that do not frequently occur. Therefore it is important to fit sustainable development in those key developments. Such opportunities should not be missed.

Given those opportunities for institutionalisation at the UA and because the true embedding of sustainable development is imperative for the permanent character of sustainable development at a university, we fully shifted our implementation strategy of start-up initiatives towards a strategy of institutionalisation. In our approach we pay full attention on the aspects of change management particularly because a university is a conservative type of organisation in which changes are not easily implemented.

The subscription of the COPERNICUS Charter shows the willingness and the commitment of the top management of the UA. Such a commitment is a critical success condition for the implementation of sustainable development.

The acquisition of external funding is in the beginning of the implementation process very valuable. But for a true and permanent institutionalisation of sustainable development in the university internal financing is a conditio sine qua non.

It is important that the implementation proposals have a scientific basis to build up academic credibility.

The first visible initiative related to the institutionalisation of sustainable development was the foundation of the PTSD and the different working groups (education, research, management). The PTSD and the working groups were founded to achieve the following aims:

1. access to policymakers, to decision power;
2. access to information about developments at the UA in general and particularly about the change process;
3. informing policymakers about the implementation of sustainable development;
4. participation of key persons of the university community;
5. bottom-up approach;
6. sensitisation;
7. leadership;
8. obtaining expertise.

To achieve the above-mentioned aims the members of the PTSD and the working groups were deliberately chosen throughout the whole university community. Within the context of the UA
it was important to have representatives of the three institutions (RUCA, UFSIA, UIA) and the Confederal University of Antwerp in the organs of the informal structure. We should always take internal sensitivities into consideration.
For the purpose of good communication and a good flow of information between on the one hand the PTSD and the different working groups and on the other hand among the

working groups themselves the selection of team members should be conducted very precise.

References

Allen, A. (1999). *Greening the Campus, Institutional Environmental Change at Tulane University,* [online]. Available from http://www.tulane.edu/~env_stud/greening.htm [Accessed 31/05/2002].

Allen, A. *Institutional change and leadership in greening the campus*. In Filho, W.L. (2000). *Sustainability and University Life*, Peter Lang, Frankfurt am Mein.

Altbach, P. *University Reform*, Schenkman Publishing, Cambridge, MA. [Citation]. In Allen, A. (1999). *Greening the Campus, Institutional Environmental Change at Tulane University,* Tulane university, New Orleans.

Clugston, R.M. and Calder, W. *Critical Dimensions of Sustainability in Higher Education*. In Filho, W.L. (2000). *Sustainability and University Life*, Peter Lang, Frankfurt am Mein.

Creighton, S.H. (1998). *Greening the Ivory Tower: Improving the Environmental track record of Universities, Colleges, and other Institutions*, The MIT Press, Cambridge.

COPERNICUS. (2002). *List of Signatories of the COPERNICUS-Charter*, [online]. Available from http://www.copernicus-campus.org/sites/list_index.html [Accessed 31/05/2002].

Filho, W.L. Sustainability and University Life: some European Perspectives. In Filho, W.L. (2000). *Sustainability and University Life*, Peter Lang, Frankfurt am Mein.

Hens, L. *The Rio Conference and Thereafter*. In: Nath, B. and Hens, L. and Devuyst, D. (1996). *Sustainable Development*, Vubpress, Brussels.

Instituut voor Milieukunde - UA, (2001). *Implemenatie van duurzame ontwikkeling aan de Universiteit Antwerpen, Eerst vorderingsverslag*, Antwerpen.

Keniry, J. (1995). *Ecodemia, Campus Environmental Stewardship at the Turn of the 21st Century*, National Wildlife Federation, Washington D.C.

Keuning, D. (1998). *Management, a contemporary approach*, Pitman Publishing, London.

ULSF (University Leaders for a Sustainable Future). (2002a). *What do we mean by "sustainability"?*, [online]. Available from http://www.ulsf.org/about.html [Accessed 31/05/2002].

ULSF (University Leaders for a Sustainable Future). (2002b). *TALLOIRES Declaration institutional signatory list*. [online]. Available from http://www.ulsf.org/programs_talloires_signatories.html [Accessed 31/05/2002].

Universiteit Antwerpen. (2000). *Beleidsverklaring van de Universiteit Antwerpen*, [online].
Available from http://www.ua.ac.be/algemeen/index.html [Accessed 16/04/2002].

Vanderborght, O. *Duurzaamheid in een veranderende wereld, Bedenkingen van een positieve wetenschapper*. In: Gimeno, P. and Weiler, R. and Holemans, D. (1996). *Ontwikkeling en Duurzaamheid*, Vubpress, Brussels.

Welford, R. *Environmental Issues and Corporate Environmental Management.* In: Welford, R. (1998). *Corporate Environmental Management 1, systems and strategies*, Earthscan, London.

Welford, R. and Jones, D. *Beyond Environmentalism and Towards the Sustainable Organization*. In: Welford, R. (1998). *Corporate Environmental Management 1, systems and strategies*, Earthscan, London.

AUTHOR CONTACT DETAILS

Tom Waas
Research fellow Sustainable Development
University of Antwerp
Institute of Environmental Sciences
UIA
Universiteitsplein 1
2610 Wilrijk-Antwerpen
Belgium
TEL: +32 3 820.21.35
EMAIL: tom.waas@ua.ac.be

Monique Sys
Coordinator Institute of Environmental Sciences
University of Antwerp
Institute of Environmental Sciences
UIA
Universiteitsplein 1
2610 Wilrijk-Antwerpen
Belgium
TEL: +32 3 820.21.31
EMAIL: monique.sys@ua.ac.be

Return to Contents

40. A new study "Sustainable Technology" in higher education,

John Woudstra & Fred Zoller

The Polytechnic Rijswijk Institute of Technology, The Netherlands.

Abstract
In this paper the first ideas and concepts of a new study at the Rijswijk Institute of Technology in Sustainable Technology will described. The study is at the bachelor's level, will take four years and will be available from September 2003.

The concept of the study is based on the integration of two roles, namely the technology engineer and the innovation manager. The Sustainable Technology engineer will make a concrete contribution to sustainable development in his role as engineer from a technology discipline like mechanical engineering, electrical engineering, engineering physics and so on. The role of innovator will ensure that he will understand the type of problems in sustainable development. He can operate in this area, because he will have a mindset including ditto skills and tools, which make him capable in tackling the complex problems.

The core-competence of the Sustainable Technology engineer is innovating. The breakdown of the core-competency is based on the innovation cycle, which plays a crucial role in how the he generates a solution and its implementation in society and in his own professional development as well.

The study system itself will be also innovative. Many recent insights and developments in education, i.e. project oriented learning, "self guided learning", will be used in the study. The student will have a large say in the way he wants to develop himself, but on the other hand he will have to accept the responsibilities and consequences as well. Of course, coaching will be an important aspect of the teaching process.

It has been shown in recent projects at the RITE that participation of industry makes a study more attractive and effective. Therefore, cooperation with industry will be an important issue in the setup of the study. As much as possible students will deal with real life problems and stakeholders.

Keywords: innovation, competencies, multi-disciplinary, international projects, industry.

Introduction
Decrease of bio-diversity, the abrasive dissimilarity of prosperity in the world, the exhaustion of energy sources, climate changes and so on, require a change in our way of conducting business as well as a change in the attitude of people. Sustainable development becomes increasingly important.

Sustainable development implies making choices and finding creative solutions in areas of conflicting interests. Government as well as industry need people who are not only technical experts but have also learned to consider different interests and to think long term. The new study prepares students to integrate sustainable solutions in their day-to-day practice. For that they need to be creative, critical and aware of their own responsibility to society.

Students will learn to cooperate with people of other disciplines. In the new study this is accomplished by the integration of a number of different disciplines taking part in the education such as electrical, mechanical and management engineering etc..
It is the intention to make this technical study attractive for females also. This is a mayor challenge, because in the Dutch culture mainly males undertake technical studies.

The core competence of the Sustainable Technology engineer is to innovate in a product environment. Sustainable technology in this context refers to an (industrial) activity resulting in products, services or technical processes, which are needed and requested by today's society without limiting the possibilities for future generations. The consequence of this way of thinking is, for instance, that in sustainable production any kind of waste is prevented.

In this paper the implementation of this new study will be described in the following steps.

- Innovation, our definition,
- Innovation cycles,
- Competencies,
- Curriculum of the course,
- International projects,
- Contributions from industry.

Sustainable Technology engineer
The goals of this study are very ambitious. At the end the student will be a “doubly equipped” engineer. He has developed the “traditional” technical competencies, which are expanded or integrated with the experience, skills and attitude, which make him a sustainable technology engineer. This is accomplished by an integration of a double track curriculum facilitated with extensive coaching. This will be explained in the following.

The core-competence that a student of this study will develop is innovation in the context of sustainability. As the study is at the bachelor’s level these students will solve problems by applying existing knowledge in situations where this knowledge is new. So the student will not develop new knowledge, but rather apply what is known already.
The RITE student will do this from a technical base-discipline like mechanical engineering, electronic engineering of engineering physics and so on.

Innovation

The definition of innovation in the context of the study will be the application of existing knowledge and experience or a combination of both to a situation, in which it is new as far as time and/or place are concerned.

There is a difference between an invention or the conviction that something (solution) is possible and an innovation integrating the invention or solution in the social or economic environment.

The art of innovation is to implement the invention or solution as effectively and efficiently as possible. One must find or create the turning point between "market pull" and "technology push" or visa versa.

- In "market pull" there is a question or problem for which a new (sustainable) solution is required. An invention may be needed to do this.
- In "technology push" a solution (invention) is already available but the application and implementation of it have still to take place.

Why is innovation needed for sustainable development?

The problems within sustainability are very complex. They require innovative solutions, because conventional solutions will not work. That is why in the study Sustainable Technology a lot of attention is given to methods

- providing a deep insight in the underlying dynamics of these complex problems (reflection / diagnosis),
- quantifying these insights in developing possible solutions by applying existing knowledge / experience while building suitable models (modeling) ,
- to elaborate these solutions into a detailed design including a plan for implementation,
- to manage the implementation of the sustainable innovation.

This is reflected in the innovation cycle to be discussed below.

Innovation cycle

In this paragraph the innovation cycle on which the core competence of the Sustainable Technology engineer is based is discussed.

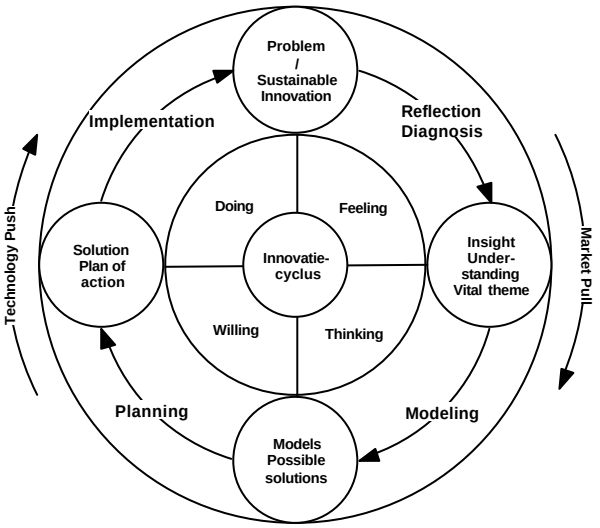


Figure 1 - Innovation cycle

The innovation process has a cyclic character and consists of four consecutive phases. In Figure 1 the innovation cycle is shown. Sustainable innovation is realized by continuous repetition of these phases on a micro- and / or macro level, on a short as well as long term time scale. In the following the four phases of the innovation cycle are discussed in more detail.

Main phases of the innovation cycle

The innovation cycle consists of four main phases. A driving force through which a specific result is obtained characterizes each main phase. In the following table the four main phases are listed.

Main Phase	Driving Force	Result
Reflection, diagnosis	Feeling	Understanding, insight
Modeling	Thinking	Models, set of possible solutions
Planning	Wanting	Solution, plan of action
Implementation	Doing	Sustainable innovation

A more detail description of the main phases is given in the next section.

Sub-phases

Each main phase consists of two sub-phases, namely

- a divergent or generation phase (D) characterized by
  - creativity and
  - quantity
- a converging or critical phase (C) characterized by
  - priority setting, selection and
  - quality.

These sub-phases are visualized in Figure 2.

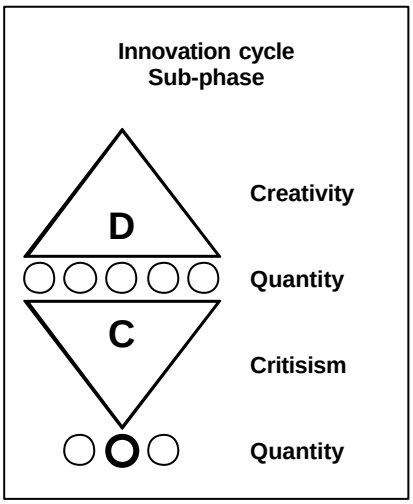


Figure 2 - The two sub-phases in a main phase

In the first or divergent sub-phase as many options as possible are generated. The keywords are creativity and quantity. In the second or convergent sub-phase these options are prioritized and selected using a set of criteria. The keywords are criticism and quality.

Entering the innovation cycle

The innovation cycle can be entered the moment a problem arises for which a solution is required. In this case the principle of market pull will be active. In Figure 1 the cycle is entered at the top.

In the case of finding an application for a given solution, i.e. technology push, the innovation cycle is entered at the bottom of the circle in Figure 1.

Description of the phases of the innovation cycle

In this paragraph a brief description is given of what has to be done per phase. In the next paragraph the required competencies of the engineer in the role of an innovator are described.

The underlying assumption of the innovation cycle is that in the ideal situation each phase is followed by the next phase. Of course this will not be true in the real world. Phases are run through fast of even skipped. The strength of the model is its simplicity, transparency en completeness, which will give structure to the innovation process and to the discussion about it.

- Phase 1: Reflection, diagnoses
  - ✓ Divergent sub-phase

    The problem is identified, explored, analyzed.
  - ✓ Convergent sub-phase

    The information of the previous sub-phase is ordered, clustered into themes. Criteria are stated. Priorities are set. A vital theme is identified.
  - ✓ Result

    Vital theme.
- Phase 2: Modeling
  - ✓ Divergent sub-phase

    The vital theme is elaborated into more detail. A number of (quantitative) options or models are generated.
  - ✓ Convergent sub-phase

    Criteria are listed. Models are validated. Possible solutions are ranked.
  - ✓ Result

    Direction of possible solutions, proposals for projects or programs
- Phase 3: Planning
  - ✓ Divergent sub-phase

    Elaboration of the possible solutions of the previous phase into detailed designs. Generation of technical solutions (content). Design of alternative plans for implementation (process).
  - ✓ Convergent sub-phase

    Criteria. Trade off.
  - ✓ Result

    Solution with a plan of action for implementation.

- Phase 4: Implementation
  - ✓ Divergent sub-phase

  Tendering. Ordering.
  - ✓ Convergent sub-phase

  Contracting. Project management. Directing the process of execution.
  - ✓ Result

  Sustainable innovation.

Competencies of the Sustainable Technology engineer

In the following the competencies of the Sustainable Technology engineer in his role of innovator will be discussed following the model of a competency . A competency has the following aspects, namely

- Task, assignment
- Activities, actions in terms of observable behavior (process)
- Output, result (content)
- Specific aids, instruments
- Knowledge, skills and attitude
- Context of the problem

Core competence

The core competence of the Sustainable Technology engineer is accomplishing sustainable innovations (to innovate) based on his grasp of the innovation cycle (process) and contributing to it from the perspective of his own technical discipline (content).

The four sub-competencies of an innovator

The four sub-competencies are based on the four phases of the innovation cycle. These will be discussed below.

- The reflection, diagnosis competency

  In this phase a great appeal is made on the empathetic powers (feeling) of the innovator.
  - ✓ Divergent phase
    - The innovator orients himself on the problem, gets himself informed by the problem owner.
    - He puts question of an informative nature.
    - He observes the environment, surroundings of the problem area.
    - He make a diagnosis using the right instruments for this.
    - He gives feed back to stakeholders.
    - His judgement is postponed.
  - ✓ Convergent phase
    - He make clusters of and orders the collected information.
    - He makes causal models (system thinking, mind mapping)
    - He reformulates the original problem into under- (more concrete) or overlying (more abstract) themes.
    - He sets priorities.
    - He makes selections for the next phase.
  - ✓ Output
    - He understands the original problem.
    - He has identified a vital theme.
    - He has made a proposal for further action.

- His decisions are justified.

- The modeling competency

The Sustainable Technology engineer elaborates the vital theme and identifies important aspects and dilemmas. He converts these into proposals for projects or programs. He facilitates the decision process.

- ✓ Divergent phase
  - He generates alternative solutions or directions for possible solutions.
  - Several scenarios for implementation are generated.
  - He applies system thinking in a quantitative way.
  - He investigates standard models and solutions and brings them together in a new setting. For this he uses his broad orientation.
  - He makes inventories of specifications and selection criteria.
- ✓ Convergent phase
  - He elaborates the models to quantified results.
  - He checks models on validity and solutions on specifications.
  - He lists advantages and disadvantages of the generated options.
  - He lists selection criteria.
  - He facilitates the selection process.
- ✓ Output
  - A set of possible alternative solutions.
  - A selected solution.
  - Justification of the decision.

- The planning competency

The Sustainable Technology engineer elaborates the selected solution into concrete design and planning. He applies his knowledge of how to design a path for implementation (proces) and makes concrete contributions to the technical aspects of the solution (content).

- ✓ Divergent phase
  - He converts the proposed solution into concrete proposals describing results, costs, means, facilities and finance.
  - He generates a set of implementation routes in which back casting or scenario techniques are used.
  - He tries to foresee consequences of his actions, to make the most of opportunities and to neutralize threats.
- ✓ Convergent phase
  - He sets up a list of criteria for decision making.
  - He facilitates the selection process.
- ✓ Output
  - A detailed design of the solution.
  - A plan of action to implement the solution.

- The implementation competency

The Sustainable Technology engineer takes part of the implementation of the solution and gives direction to the process of it. He makes intermediate evaluations and takes precautions to anchor the result of the innovation process.

- ✓ Divergent phase
  - He makes tenders and contracts.

- He prepares the execution of the plan of action.
- He designs a project start up.
- He generates commitment under the people involved with executing the plan of action.

✓ Convergent phase
- He gives direction to the process of implementation as a project manager.
- He communicates to the stakeholders.
- He takes care of the internal and external interfaces of the project.
- He reports on the progress of the implementation process.
- He performs (intermediate) evaluations of the process.

✓ Output
- A sustainable innovation.
- New problems.

Curriculum of the study Sustainable Technology

Set up

The set up of the curriculum is

- to focus on "deep" in time (long term) and technology (expert, specialist) and "broad" in terms of complexity (number of stakeholders etc) of the problems in the context of sustainability,
- to bring together separate aspects,
- to identify dilemmas and deal with them,
- natural integration of thinking and doing.

The curriculum takes four years. In the following these years are described briefly.

The four years of the curriculum

A student is admitted to the study after an intake assessment. In this session there will be an assessment on knowledge, experience, skills, and attitude (more general: competencies). A personal profile is made up. Based on this a contract in terms of a personal development program (PDP) is signed by student and institute.

Year 1: Orientation, selection

In the first year students get acquainted with the school, the study system and the work field. Basic mind tools (creativity, mind mapping, system thinking) will be taught. Of course, the elementary concepts of technology will be an essential part of the program, but also the diverse contexts of sustainability like environment, business, politics, government, social and cultural settings, industrial research. In this phase "learning to learn" is very important, which is done in close cooperation with a coach. During the year there will be intermediate partial assessments and at the end of the year an overall assessment. The outcome is used as input for the personal development program of the next year.

Year 2: Discovery journey

The skills for which a basis has been laid in the first year will be developed further in the second year. Depending on the personal development program a student will put different emphasis on the different competencies. There must be a balance between development of the weaker competencies and the application of the stronger developed competencies to keep up high motivation and continue the development progress.

In this year several themes in sustainable development will be explored: energy, production, transport and so on. More complex real life projects will be carried out for industry or government. Excursions to other technical and non-technical disciplines will be made.

Year 3: Deepening

The first half of this year will mainly be devoted to the deepening of the knowledge of his technical discipline. Based on his again renewed personal development program the student will follow courses in his area of interest within his discipline. For this it may be needed to visit other institutes as well.

In the second half of this year the student will be working in industry or government for his practical period. The student will be encouraged to go abroad.

Year 4: Innovation project

After the third year the student is well equipped with knowledge and skills (competent) to participate in a one-year multi-disciplinary project in the area of sustainable development. Again, his personal development program has been updated. During the project he will

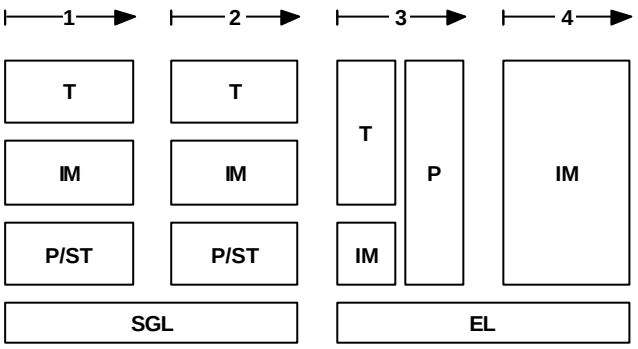
have to complete his knowledge and skills to accomplish a successful project result in terms of his own masterpiece (content) and fulfill his own learning goals stated in the personal development program (process).

Contents of the curriculum

The four-year curriculum consists of eight semesters. Each semester has the following contents, namely

- technology of the base-discipline,
- management of innovation,
- project in the area sustainable development,
- "self-guided learning" transferring to "enterprising learning".

Figure 3 - Curriculum



The curriculum is depicted in figure 3 and explained below

Years 1 and 2

In the first two years 30% of the time will be spent on the development of the technology knowledge and skills of the base-discipline (T). Another 30% is devoted to management of innovation (IM). The sustainable technology project (P/ST) will take also 30% and 10% is used for coaching in self guided learning (SGL) in which the following activities take place, namely

- intake assessment,
- set up of the personal development program,
- reflection on experiences, progress and adjustment of the personal development program,
- assessment on self guided learning.

Year 3

No projects will be carried out during this year. Instead, the first half will be used for deepening (specializing) the technology competencies (60%, T) and management of innovation (30%, IM). Again 10% is used for self-guided learning which has been transferred to "enterprising learning" (EL).

Year 4

In the fourth year an ambitious innovation project will be carried out. Student teams of about 6 to 8 students from different technical and non-technical disciplines will work together in an innovation project passing through all phases of the innovation cycle.

International projects

In the concept of sustainable technology special interest is focused on the ability to identify problems in a broad perspective. The issues that are dealt with are complex and not always clearly defined. In today's society the main issues extend beyond the borders. Global influence increases because of the progress in communication technology, the growth of international trading and the increasing mobility of people. This affects the global economy, the social structures, our different cultures and the environment. More than ever people have to deal with international issues. In our view, students must be prepared for these changing circumstances during their study. The intention is to set up international projects and international practical semesters.

Contributions from industry

The companies in today's society are forced to deal with the interest of not just their clients. Students become a group of increasing importance; they are future employees. The government is cutting back it's contribution to education assuming the parties involved will take their responsibility. Keeping up with trends and developments in engineering practice is one of the main objectives in our professional education. Then, in our view, an increasing contribution of industry to education is unavoidable. This may take place in several forms, for instance in joint participation in workshops, lectures, excursions, projects.

Conclusion

A new study Sustainable Technology has been designed and will be available from September 2003 at the Rijswijk Institute of Technology, The Netherlands. The study itself and the applied didactic concepts of “self guided learning” (later “enterprising learning”) will be innovative. Sustainable industry will play a great role in the development of these Sustainable Technology engineers.

Appendix – Competency

At this moment in The Netherlands the professional profiles of all technology engineers at the bachelor level are being updated in terms of competencies. The term competency has been shown to be an adequate concept for describing the required knowledge, skills, attitude and tools for an engineer to employ in a typical professional context. The model of a competency is a description of at least the following aspects, namely

- the actual, real life context or professional setting in which a problem occurs or task is given,
- the (observable) result to aim at,
- the required technological knowledge, skills and attitude in this context,
- the characteristic tools for problems or tasks in this context,
- observable behavior in actions to fulfill the task.

These aspects are visualized in Figure 4.

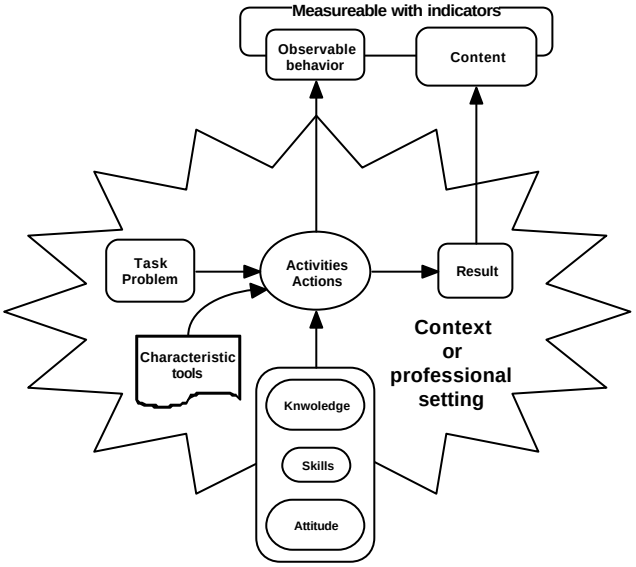


Figure 4 – Competency

About the authors
Ir. P. Menger, MOI
Lecturer Technology Management
Team member “Sustainable Technology”
E: mg@thrijswijk.nl

Ir. J.B. Woudstra
Head faculty Electronic Engineering
Project manager “Sustainable Technology”
E: wa@thrijswijk.nl

Ing. F.C.M. Zoller
Lecturer Mechanical Engineering
Team member “Sustainable Technology”
E: zo@thrijswijk.nl

RITE Rijswijk Institute of Technology
Lange Kleiweg 80
2288 GK Rijswijk
The Netherlands
T: ++31 (0)70 3 401 500
F: ++31 (0)70 3 192 406
E: info@thrijswijk.nl
W: http://www.thrijswijk.nl

Return to Contents

Abstracts - final papers not received

1. Bridging the gap between high studies and local grassroots action: How Akposso students of Togo do participate into collective actions to protect forests.

Koffi Alinon

KEY WORDS: High education / reforestation projects / sustainable development / Togo.

Togo's high population growth rate has placed increasing pressure on the country's natural resources. The need for firewood has resulted in one of the highest rates of deforestation in Africa. This has led to the desert encroaching from the north, although the government has launched a reforestation program to try to halt the desert's advance. Some of Togo's many mammalian species are threatened. Nearly 7.9 percent of the country is protected[i], however, and a number of international conservation agreements have been signed.

The Akposso come from the plateau region of south-western Togo which hosts a residual branch of Guinean Forests of West Africa. The Togolese highlands were highlighted as one of the most important areas for biodiversity in the Guinean hotspot, yet little is known about this area[ii]. Students from this region have grouped themselves in the early 1970s in an informal association (named AESPA) which aims to discuss educational and social issues. To focus the association on these noble goals was in itself a sort of revolution because the secret objectives of authorities when accepting such unions were to foster their political obedience. One of the interventions of AESPA concerns the trees planting project in the village of Kpategan.

The presentation will concern the period of 1995 when I personally leaded this organization. The particularity of the operation undertaken is the involvement of the private sector in the initiative (the Shell Company) and the adding of public awareness meetings to the project.

The paper will emphasis on the prerequisites that conditioned the realization of the project:
Acommonly shared commitment of each member of the group, the acceptance of financial contributions even symbolic and a lobbying action.

We must also report on the risks that such a project encountered:
- the political unrest that occurred in the 1990s in Togo,
- the lack of definition of a fixed status of the planted areas regarding the tenure relationship vis-a-vis the land owners,
- the follow up of the operation in terms of watering the trees in the dry season and preventing bushfires.

To link the described experience to the conference theme, we must remind the reasons that turn educational challenges crucial for sustainable societies. Three main seem important:

-the global sustainability challenge is unprecedented in both magnitude and complexity,
-there is no history of societies willingly and deliberately taking steps to institutionalise restraints and change individual and collective behaviours to achieve greater sustainability,
-a constructive educational response must include a comprehensive, coordinated attempt to redefine the human role in nature and reexamine many assumptions, values, and actions we have long taken for granted

In brief as Disinger (1993) mentioned it, "we must prepare each student to lead a sustainable lifestyle and place ecosystems concepts at the intellectual center of all disciplines."[iii] For a developing country like Togo, before students can address global environmental issues, they must be knowledgeable about problem identification, interrelationships and alternatives.

The challenge for high education is to make these issues meaningful to learners by focusing on individual contributions to the problems, and then, using participatory strategies to develop, refine and redirect the thinking and the learning. The University of Benin in Togo does not yet meet that strategically willingness at its top institutional level. This is why individual initiatives come at rescourse but with limited influence.

Following Tilbury (1995), we can say that the University in Togo is still dealing with a policy of "the traditional environmental education". This author characterises traditional environmental education as being "about" the environment; students gain awareness, knowledge, and understanding of human-environment interactions, usually within the context of a science, social studies, or geography class[iv].

By the activities they have carried out in Kpategan, the Akposso students experienced another approach: the education "in" the environment; where experiential learning fosters both awareness and concern for the environment. But furthermore, Tilbury advised to target the education "for" the environment that would promote "a sense of responsibility and active pupil participation" in resolving environmental problems" (p. 207). Academic authorities should build new curricula to support such a plea.

NOTES

1. 1997 estimation of the World Bank, Report N° 14041-TO.
2. The zone is now benefiting special attention from the CEPF fund. See: www.cepf.net/
3. Disinger, J. (1993). "Education". In Rebecca Stutsman, (Ed.), "From Rio to the capitols: State strategies for sustainable development". Louisville, KY: Commonwealth of Kentucky.
4. Tilbury, D. (1995). "Environmental education for sustainability: Defining the new focus of environmental education in the 1990's". Environmental Education Research, 1(2), 195-212. [EJ 509 039]

2. The experiences of promoting college sustainable development education in Taiwan

Tzuchau Chang

National Taiwan Normal University, Taiwan, Republic of China

The Ministry of Education of Taiwan has funded a project to promote education for sustainable development in colleges for three years. This project began with roundtable forums to discuss the contents of sustainable development for college general education in 1999. The roundtable discussions have concluded four major components of sustainable development form the perspective of education. They are environmental ethics, sustainable environment, sustainable society, and sustainable economics. The contents of each component were well discussed and described.

Establishing the curriculum framework of sustainable development for general education and designing curriculum for sustainable development were the major endeavors in the second stage. The curriculum of sustainable development education consisted of twelve teaching modules. They cover the issues of environmental ethics, economical development, community development, social justice, human rights, environmental actions…etc.

In the final stage of this project, an interactive internet learning web, an international conference, and a sustainable development education workshop for college teachers were held. In order to promote using these teaching modules, an interactive learning web of sustainable development education was established to encourage college teachers to teach sustainable development and share their experiences. An international sustainable development education conference and a workshop for sustainable development education were held to exchange the experiences of teaching sustainable development and to improve the teachers' abilities of teaching sustainable development.

Finally, in order to understand the opinions about the college sustainable education of the teachers who attended the conference, a survey was conducted during the conference. The questionnaires were distributed at the lunch. About 100 college teachers attended the conference, and 49 of them returned questionnaires.

1. Regarding to teachers' experiences of visiting the learning web for sustainable development education, only 28 of the 49 respondents have visited the learning web. Obviously, the web is not well known to college teachers.
2. Regarding to the value of the web for sustainable development education, fourteen teachers thought the web page of teaching resources was the most valuable. Next to the teaching resources was the web page of teaching modules, which was chosen as the most valuable by 9 teachers.
3. Regarding to the international conference of college sustainable development education, two questions were asked. One is "Where did they get the information of the conference?", and the other one is "What topics should be offered in the conference?". Most of the teachers got the conference information by e-mail notice. What topics should be offered in the conference? Other nations' experiences of sustainable development education are the most needed for the teachers. The international experiences of

sustainable development instruction and the workshop for sustainable development education are the two more frequently requested choices.
4. Regarding to the teachers' willingness to teach sustainable development in colleges, the data shows that most teachers are willing to share their experiences of teaching sustainable education in colleges, and to teach the teaching models in the web and share their instruction experiences.

Keywords: Environmental Education, Sustainable Development Education

3. The Global Environmental Management Education Center

Michael P. Dombeck & Victor D. Phillips

University of Wisconsin-Stevens Point, USA

Contacts-

Victor D. Phillips, Ph.D. (Dean, College of Natural Resources, University of Wisconsin- Stevens Point)
College of Natural Resources University of Wisconsin-Stevens Point
1900 Franklin Street
Stevens Point, Wisconsin 54481
United States of America
Phone: (715) 346-4617
Fax: (715) 346- 4554
e-mail: Victor.Phillips@uwsp.edu

Michael P. Dombeck, Ph.D. (Professor of Global Environmental Management, University of Wisconsin-Stevens Point)
College of Natural Resources University of Wisconsin-Stevens Point
1900 Franklin Street
Stevens Point, Wisconsin 54481
United States of America
Phone: (715) 346-3946
Fax: (715) 346- 4554
e-mail: Mike.Dombeck@uwsp.edu

Keywords-

Education, Management, Natural Resources, Conservation, Partnerships, Sustainability, Planning.

Rapidly accelerating global environmental change poses an increasing threat to our personal, local, national and global security. The key to enhancing our security and building a sustainable future is providing the best education possible in natural resources and environmental management. This educational enterprise should provide learning experiences at the global level that generate and deploy creative solutions to local resource issues.

Local citizens and communities in the USA, and other nations of the world share the same fundamental values such as security, freedom, health, meaningful work, peace, and spirituality. People everywhere face similar challenges that limit or threaten meeting these basic needs, most if not all of which involve utilization and equitable access to natural resources.

The Global Environmental Management (GEM) Education Center at the University of Wisconsin-Stevens Point is a unifying concept, program and facility of the College of Natural Resources, the premier and largest undergraduate institution of natural resources and environmental management in North America. It has deep roots in the strong Wisconsin conservation heritage, built by Aldo Leopold, John Muir, Gaylord Nelson and others. GEM's goal is to provide intercontinental learning bridges to build a sustainable future.

The GEM Education Center intersects the College's teaching, outreach, and research components. Further strengthened by emerging tools and methods in technology and communication, GEM will extend the College's state-of-the-art educational reach and capability to our students and stakeholders in communities of Wisconsin as well as to others beyond state, regional and national borders. Through virtual and real field experiences and training opportunities overseas, an internationally experienced staff and partners abroad will offer innovative natural resource programs. The GEM Education Center invites partners and sponsoring organizations to help design and implement core programming to build a sustainable future. GEM program priorities include:

* Watersheds management
* Smart growth land use planning
* Becoming an outdoors woman
* Ecotourism and nature interpretation
* Rural leadership and community development
* Sustainable forestry
* Conservation and environmental education
* Sustainable energy systems
* Environmental management certification and compliance

More information can be found online at our website http://www.uwsp.edu/cnr/gem/

4. Sustainable short sea shipping: A multidisciplinary project in education in sustainable development

Formatted
Formatted

Anja de Groene & Adriaan Temmink

Hogeschool Zeeland, Vlissingen, The Netherlands

Anja de Groene, PhD., professor of Sustainability, Hogeschool Zeeland, Vlissingen, The Netherlands
E-mail jgroene@mail.hzeeland.nl
Phone + 31 118 489224

Adriaan Temmink, PhD., lecturer maritime technology at the Maritime College, Hogeschool Zeeland, Vlissingen, The Netherlands
E-mail atemmin@mail.hzeeland.nl
Phone + 31 118 489164

Like several other universities Hogeschool Zeeland (The Netherlands) aims to integrate sustainability into its entire curriculum (engineering, economics, social sciences, education, etc). Apart from courses, inter- and multidisciplinary projects can contribute to this goal. One example of such a challenging project is the sustainable short sea shipping. This project, jointly set up with the Dutch shipping sector, will prove in practice what can be done to combine environmental solutions with economic feasibility, safety and human aspects of a ship. A sustainable ship can be defined as a vessel that sails safe, clean, economic viable with a content crew. For two years the possibilities for implementation concepts of sustainability and upgrading parts of the ship will be investigated. When proven to be feasible, these changes will be implemented on a prototype ship during its next docking period. This ship represents 30% of the Dutch sea going fleet.

The project has started in September 2001; about 50 students from Hogeschool Zeeland studying for maritime officer and in economics, have participated in eleven sub projects. The sub projects deal with **economic** aspects; to optimise the exploitation of a ship in all respects. Examples are energy efficiency and saving and implementation of ingenious solutions of cleaning the cargo, thus saving valuable time and labour. Better environmental performance may result in decreasing port dues, tonnage tax and passage dues.
Examples of **environmental** aspects are garbage and waste handling, alternative paints, reduction of emissions, oil spills, possibilities to dispose bilgewater. One project deals with environmental management systems.
Safety aspects treat spillage of oil bunkers, integral support systems and also IMO-regulations related aspects (International Maritime Organization) and SOLAS (Safety Of Live At Sea).

Finally the **human** aspect; keeping staff involved motivated for modern shipping is one of the project's major items. Educational training programs, communication, increasing awareness of the environment are instruments to create a " happy ship". On the other hand, increasing automation of installations, ergonomics, etc., can also contribute to a more people friendly environment.
The projects show that sustainable shipping balances between environmental, economic, safety and human aspects.

During the project all information will become available in a new knowledge center. Apart from an increased knowledge in a more than practical way, the students have contributed to the extension of knowledge available to the coaching lecturers. In their turn the lecturers can transfer this knowledge to younger students and so diffuse knowledge effectively.

The paper will deal with the results of the sub projects. Also the cause, preparation, execution, involvement of students and teachers from different disciplines and follow up of the project will be discussed. Organisational and political issues linked with this type of multi disciplinary, multi stakeholder, long term projects, will be raised as well.

5.Teaching of interdisciplinary land-use and natural resource management through the SLUSE approach: the southern African University consortium experience.

Torben Birch-Thomsen & Trevor Hill

Torben Birch-Thomsen – Associate Professor, Institute of Geography, University of Copenhagen, Copenhagen Denmark. (tbt@geogr.ku.dk)
Trevor Hill – Senior Lecturer, Discipline of Geography, School of Applied Environmental Sciences, University of Natal, Pietermartizburg, South Africa. (hillt@nu.ac.za)

This paper describes how interdisciplinary teaching in natural resource management and development in developing countries has been pursued and operationalised by a consortium of three Danish universities; Sustainable Land-use and Natural Resource Management (SLUSE) over the past four years. The consortium has enhanced the co-ordination of relevant disciplinary teaching making it attractive for students to follow courses at all three universities, in particular, a joint course has been created which allows for the cross-pollination of ideologies and approaches from the participating universities. An important component of this joint course is a collaborative field–based problem orientated course that links Danish students with students of Malaysia, Thailand and southern Africa. This adds an intercultural dimension to the learning environment and co-operation among the universities creating both a north-south and a south-south linkage. Within this paper pedagogical considerations, approaches tried and lessons learnt are shared using the southern African experience as the case study.

6. Environmental Benchmarking in UK Universities

Peter James

University of Bradford

Keywords - environmental benchmarking, environmental performance measurement, environmental change in universities

Although many universities now have environmental policies, and a small but growing number have environmental management systems, achieving significant changes in environmental performance remains difficult. Two important reasons for this are that internal environmental champions o ften lack crucial change skills, and cannot easily benchmark performance against that of other institutions. The Higher Education Environmental Performance Improvement <HEEPI> initiative aims to improve this situation for UK universities by developing environmental benchmarking, and strengthening the environmental competence of estates, facilities, procurement and other non-academic staff. The project is funded by the Good Management Practice initiative of the UK Higher Education Funding Council, and will run for two years from September 2001. One strand of activity is developing a standardised set of environmental performance indicators for UK universities, contained in an on-line database. Other strands of the work are workshops on environmental change skills, and development of best practice case studies of environmental improvement in UK universities. The paper will review project outcomes to date, and discuss differences between environmental performance improvement in universities and other sectors.

7. Participatory processes in environmental management: The University of the Western Cape case study

Charmaine Klein

University of the Western Cape, South Africa

Presenter: Charmaine Klein, Environmental Education & Resources Unit, UWC, Private Bag X17, Bellville, 7535

This project investigated the factors involved in the processes of participation as an important component in environmental management. At the University of the Western Cape, environmental management and sustainable development are developing in terms of linking theory and practice. The aim of the study was to determine the factors or requirements needed to be in place for 'public' participation where the community or public would possess sufficient skills to make informed decisions during such processes. The research planned to investigate ("unpack") these issues and also to examine all the factors contributing to or hindering such processes. It examined for example, the participatory process itself, prior knowledge of the participants, facilitation of the participation process, as well as transparency and environmental justice in decision-making.

This study forms part of a series of case studies. The research originated from a need to involve the University of the Western Cape in the practices of environmental management and to challenge the current unsustainable environmental practices by both students and staff. At the same time the research data generated was to contribute to the existing curriculum of the University.

8. Sustainable growth without an input from business ethics?

Laetus O.K. Lategan

Technikon Free State, South Africa

Dean: Research & Development
Technikon Free State
E-mail: Llategan@tofs.ac.za

Sustainable growth has become the "chorus" of many societal institutions and practices. Yet, in literature, concern is raised that although institutions are challenged to perform according to criteria for sustainable growth, very little is said about sustainable growth itself. One of the critiques on sustainable growth is coming from business ethics. Examples of this critique are:

- What role should the "common good" play in sustainable growth?
- Does a postmodern culture allow for a common value in sustainable groth?
- Who's responsibility is it to attend to the needs of sustainable growth? Is it only the responsibility of top management, middle management or all employees?
- What role should "whistle-blowing" play in maintaining sustainable growth?

Against the background of these and other questions, this paper will argue that a sense for business ethics should be introduced in all academic curricula. Such an approach will entail the following:

- What is business ethics?
- How can business ethics impact on sustainable growth?
- Case-studies to illu strate the role of business ethics in sustainable growth

During the seminar the urge for the introduction to business ethics, will be debated against the background of three published case-studies (A brush with Aids, The serphant was there and The parable of the Sardhu) as well as case-studies presented by students against the background of their own experience.

9. African ecology and sustainable development - education initiatives at the University of Fort Hare, South Africa

Peter C. Lent* and Isaac M. Ortega**

University of Fort Hare, South Africa

The University of Fort Hare, with a main campus located in Alice, Eastern Cape Province, South Africa, is uniquely placed historically and geographically to play a key role in environmental education, conservation and sustainable development programmes. As a rural institution it has developed appropriate programmes to focus on its mission in an African and international context. Recent university re-organisation brings agriculture, geography and environmental science programmes together in a single faculty, thus facilitating multidisciplinary approaches.

One new thrust involves development of an African Ecology programme based at the nearby Great Fish River Reserve. The initial effort in this programme involves a linkage with the University of Connecticut (Storrs CT, USA). This partnership has recently undertaken a 3-week course attended by 16 undergraduate and post-graduate students from that institution combined with five University of Fort Hare students. The syllabus provides all with practical experience and training working in the ecosystems of the reserve. Flora and fauna diversity, animal nutrition and behaviour are some of the highlights of the class, however, numerous opportunities are provided to understand the broader social, economic, and cultural aspects surrounding the reserve.

Plans are underway to expand the offerings to encompass in future years a combined remote sensing, GIS and African ecology syllabus, which will focus on tools to monitor and manage sustainable development. In addition, further emphasis will be placed on international understanding and perspectives through various mixes of American, European, East African, and southern African students and staff.

*Free Ranging Animal Programme, University of Fort Hare, Alice 5700, South Africa, Plent@ufh.ac.za

**Department of Natural Resources Management and Engineering, University of Connecticut, CT 06269 morty.ortega@uconn.edu

10. Demand driven training between Ghana and the Netherlands: Forest Management Planning Training Tool

Marc Parren

University of Professional Education Larenstrein, Velp, The Netherlands

This paper outlines the development of a tool appropriate for the needs to manage the national forests of a developing country such as Ghana. This is done by integrating existing knowledge of social, ecological and economical information at reserve level. To integrate and to make the information visual thematic maps are produced by linking databases with Geographical Information Systems. A hyrarchical system of lecturing modules will be presented to reach these goals and offered at Higher Education and Professional Organisations as a way of North-South cooperation.

11. Decision Making for Sustainability - a Role for All Stakeholders

Jim Petrie[1,2] and Lauren Basson[1,2]

1. Department of Chemical Engineering, University of Sydney, Australia
2. Department of Chemical Engineering, University of Cape Town, South Africa

This paper describes the philosophical basis for a course in Decision Making for Sustainability in which explicit account is taken of stakeholder values and preferences.

We take the view that a commitment to Sustainability requires transparent, defensible and accountable decision making processes to guide all decisions, covering *inter alia*, technology design, manufacturing operations, resource management and, indeed, public policy situations. It is recognised that those people who may be affected by decision have a right to have input into the decision or at least have confidence that their needs and perspectives have been considered during decision making. This highlights the issue of legitimacy, where the emphasis should be placed not so much on the outcome of a decision, or who makes it, but rather on the *process* by which decisions are made. Particularly for decisions that may affect many people with different perspectives and which may have ramifications over large areas and long periods, discursive and participatory approaches to decision making are essential. Only through such are we likely to fully comprehend the range of issues to be considered, and be able to engage with the diversity of stakeholder values and preferences which characterise a given situation.

In many cases, this is new territory for engineers, and requires new tools and skills. Amongst these are the ability (i) to function as part of a multi-disciplinary team, (ii) to model complex systems and identify the requisite information to support decision making, (iii) to consider multiple, conflicting objectives simultaneously without resorting to a simplistic decision rule that allows a single objective (typically economic one) to dominate, (iv) to effectively manage and communicate uncertainties and, (v) where necessary, to integrate their activities into a social process of decision making. We contend that the task of analysing decision contexts, structuring problems in a way which facilitates rational decision making, and bringing all this together in a manner which ensures the clear identification of decision objectives, and the criteria by which possible decision outcomes can be assessed, poses both academic and practical questions; and that this material is worthy of a university Engineering course.

12. A Structured Approach to Promoting UCT's Capacity in Sustainable Development

Jim Petrie, Geoff Brundrit and John Raimondo

University of Cape Town, South Africa

The University of Cape Town has internationally renowned research programmes in the bio-physical environment, in technology and management for the environment, and in many areas of health and development studies. At the same time, its teaching and outreach programmes reflect the strongest commitment to human resource development in related areas. All of these contribute, separately, to the institution's promotion of Sustainable Development as a strategic imperative. However, the "separateness" of much of this activity poses certain challenges, relating both to efficiency and opportunity.

This paper addresses the following:

- How to facilitate more effective collaboration between existing, traditional Faculty structures with their own professional drivers and goals?
- How to promote the need for, and value of, interdisciplinary research and teaching ?
- How to engage effectively with all stakeholders, to ensure legitimacy, transparency and accountability in all programmes aimed at promoting Sustainable Development?

These questions are explored in the context of the establishment of UCT's "Partnership for Sustainable Development" a new venture whose vision is encapsulated in the following:

"UCT aims to establish itself as the internationally recognized leader of research, teaching and outreach in the field of environmental sustainability within the African context."

In order to take this Partnership forward, UCT has engaged in broad-ranging discussion with major stakeholders, both internal and external to the institution. The results of this engagement are discussed here, specifically with regard to the shape and form of operational models which would be best able to deliver on the University's vision. Comments are offered on the identification of criteria and performance measures which enable model options to be distinguished from each other. These include consideration of governance and funding structures, operational features (its ability to promote scholarship, its degree of flexibility and ability to integrate existing academic structures, amongst others), and marketing potential.

This venture represents a significant and exciting opportunity through which to encourage cross-faculty research, teaching and outreach in Sustainable Development, focusing on links between the socio-economic, bio-physical and management spheres of human interactions with the natural environment.

13. Obstacles and Opportunities in ICT's Energy-Efficiency : A Perfect Experiment Playfield for Sustainable Universities

Jacques ROTURIER

University of Bordeaux, France

During the last past 15 years, in a long run to Energy-Efficient IC&Ts, scientists from several universities, including University of Bordeaux 1 since the early beginning, institutes, laboratories or consultants worldwide, have devoted many efforts to convince policy-makers, manufacturers and users to not ignore the I&CTs as a key energy end-use sector. Firts regarded as a « peanuts'story », the studies were however later on supported and co-funded by international institutions and Energy & Environment Agencies. In the same period of time, in the framework of the first Earth summit (Rio-de-Janeiro 1992), then for similar reasons, becoming more and more concerned with the environment issues, many teams of scientists : (i) created adapted new Academic Programmes, (ii) also implementing quite exciting research work in this area. It is to be noted that, a much more limited number of teams of scientists, regarding the training of the whole students and staff community as a unique affordable commitment ("Practice-What-You-Preach"), a matter of ethics actually, they decided to establish within their own HE institution, as a third goal, the environmental issues as a management priority.

To our opinion, time is now for merging both analysis as resulting from the experience gained at University of Bordeaux 1 where research on both issues were started late 80's … in spite of many obstacles. In particular when the growth of the electricity demand was analyzed, and measured to be continuously in a 5-7 % range, it became clear that the Office Equipment end-use sector (a previous name for the to-day's so-called I&CTs or, more common, Internet) has contributed to an important share of such growth. The main goal of the present paper is then to demonstrate that I&CTs may be seen as a significant cornerstone to implement an environment strategy. In section 1, a brief survey of the 15 years long run (1987-2002) to Energy-Efficient IC&Ts is given; in particular the move from the *"More GigaBytes, less TWh"* of the 1992-2001 decade to the "*More TeraBytes, less GW* " in the next 2002-2011 decade, is shown. In section 2, a summary of data, including a few case-studies, is presented that intrduces some implementation of DSM programmes in HE institutions thanks to I&CT's capabilities. In section 3, a prospective view of possible impacts of the unavoidable - although usually ignored - evolution of the electricity supply industry, and of the whole electric industry : if everybody knows that DC power is the standard final use of electricity in I&CTs, a few people only are really aware of the dramatic changes that are to be expected when the majority of electricity end-uses will be DC powered. In conclusion, the guideline of the paper may be possibly summarized by the following : ICT's/Internet electricity demand growth seems to be out of (human) control to-day! Does the HE sector may possibly contribute to harness it to-morrow through "*In-House"* appropriate training and research activities ?

14. The contribution of the University of Port Elizabeth to sustainable management: lessons at a range of scales.

Bernadette Snow[1] *and Graham I. H. Kerley*[2]

University of Port Elizabeth, South Africa

[1] Department of Zoology, University of Port Elizabeth, PO Box 1600, Port Elizabeth, 6000. E-mail: zlbbbs@zoo.upe.ac.za Tel: +27 41 504 2316

[2] TERU, University of Port Elizabeth, PO Box 1600, Port Elizabeth, 6000. E-mail: zlagik@zoo.upe.ac.za Tel: +27 41 504 2308

Tertiary education is tasked with not only education but with being on the forefront of change, guiding and assisting the broader community. Increasingly the focus of their contributions is on providing society with options and tools for the wise and sustainable management of the natural and developed environment. The University of Port Elizabeth (UPE) is making a significant contribution in this regard, at a range of scales, each reflecting a different community being served. At the global scale, the University is contributing toward the development of best practise options and protocol for the conservation of biodiversity. This reflects the expertise within the University, as well as the location of the campus on the borders of two internationally recognised hotspots of biodiversity. On a national scale, plans are being developed for the conservation and sustainable management of elements of biodiversity of national and regional importance. On a local scale, research and teaching have provided a major boost to a number of large conservation areas as well as the regional important game-based industry. On a metropolitan scale the University is playing a key role in the development of a systematic objective conservation plan for the Nelson Mandela Metropole Open Space System (NMMOSS), a global first. On a more local scale, the Grysbok Environmental Education Trail provides educational experience and hopefully an appreciation of the need for sustainable management of resources by the community of school learners who participate in the trail. On the campus level the UPE Private Nature Reserve provides protection for a globally threatened vegetation type and within its built environment UPE has a well-developed environment policy that has served as a guide for many other South African Universities. The linkage between all these different scales of sustainable management is the Universities commitment to contributing to sustainable management, the excellence of the staff and students and addressing real world issues in our teaching and research programmes.

Keywords: University of Port Elizabeth, Sustainable Management, different scales.

15. EAUC and "A Practical Guide to Waste Management for Universities and Colleges" in the UK

Mary Webb & Bob Gilmour

EAUC, UK

Keywords: Environmental network, guidance, waste reduction, waste management

The Environmental Association for Universities and Colleges (EAUC) was set up in 1996, by and for those responsible for practical environmental issues within Further and Higher Education in the UK. It successfully provides a formal network for exchange of information and collaboration and is a collective voice for the sector with a growing membership and increasing recognition. Conferences and seminars inspire and renew the enthusiasm of those who attend. Special interest groups on waste, transport and purchasing have been set up to further the assistance and guidance on these topics.

Waste was the first issue to be tackled in depth. Waste produced by Universities and Colleges is increasing every year. The exact amount is unknown but, given the 700 institutions and millions of students and staff, it will be large. There are many examples of guides for industry on managing waste, but until now, there has been no help for further and higher education (FHE). There are no easy ways to cut costs in this sector and academic staff and students are not as easy to manage as a more biddable workforce in industry.

This is the first Practical Guide to be published EAUC and the first specifically aimed at waste management for this sector. It covers solid waste concentrating mainly on household waste, which makes up the bulk of the waste produced in FHE. Procedures for managing and disposal of special and clinical wastes safely and legally are mentioned.

The first step is "knowing" your waste, what it costs and who is responsible for it. A review is the first phase of an overall waste planning exercise that could start simply, concentrate on quick wins and visible results, then build up to a fully integrated waste management plan. The Guide includes template forms to use when reviewing and managing waste.

The guide stresses the importance of reducing the volume of waste through minimisation and recycling, covering the roles of education and environmental procurement. Examples of successful recycling initiatives are provided with an alphabetical listing of wastes that can be recycled.

Disposal of some wastes is always unavoidable and help is provided on the best ways to deal with this, as well as advice on contracts. Management processes of all aspects of waste are described, from policy and planning, through procedures and training, to evaluation and improvement, leading to the development of a waste management system.

Case studies used in the Guide have demonstrated significant financial savings as well as reductions in the waste produced. Other less measurable benefits have included: savings in space utilisation, greater levels of environmental awareness and improved image for the organisation.

By employing the good practice in the Guide, FHE institutions can make efficiency gains, save money in disposal of waste, help to ensure compliance with legislation and improve their overall environmental performance.

Authors:
Dr Bob Gilmour, Glasgow Caledonian University
Senior Lecturer in Environment and Waste Management at undergraduate and post-graduate level.
Co-author of "A Practical Guide to Waste Management for Universities and Colleges"
A corporate member of the Institute of Wastes Management and Chartered Institute of Water and Environmental Management.
Chair of the University Waste Management Working Group, which manages the practical issues of waste within the institution.
Glasgow Caledonian University, Dept EET, Cowcaddens Road, Glasgow G4 0BA
Tel 44 (0) 141 331 3571
r.a.gilmour@gcal.ac.uk

Mary Webb, Oxford Brookes University
University Environmental Co-ordinator.
Secretary EAUC Steering Committee 1998-2002. Co-editor of "A Practical Guide to Waste Management for Universities and Colleges". Co-author and editor of the Oxfordshire Country Walks series.
Oxford Brookes University, Estates and Facilities Management, Gipsy Lane, Headington, Oxford, OX3 0BP
Telephone 44 (0)1865 483296
mwebb@brookes.ac.uk

Return to Contents

List of Delegates

Note: This is not a final and complete list of delegates. The final list will be collated at EMSU and made available on www.rhodes.ac.za/environment/emsu shortly after the end of the conference.

	firstname	surname	organisation	postaladdress	city	Postal code	country	phone	fax	email
1.	Opeyemi Ishola	Adeyemi	Irit of Africa Nigeria Ltd	Arit Bld, Arit Rd 10 Darlington St Mokola	Ibadjan	200001	Oyo StateNG	23422410785	2342 8108519	aritafrica@email.com
2.	Jerome Benedict	Agbo	Ahmadu Bello University Zaria, Nigeria	Faculty Of Education Ahmadu Bello University Zaria	Zaria	810001	Kaduna State - Nigeria	234-069-550369		jerome_agbo@africamail.com
3.	Koffi	Allinon								kof30al@yahoo.com
4.	Wayne	Anderson	Associated Colleges of the South	1975 Century Blvd., Suite 10	Atlanta	GA 30345		(404) 636-9533	(404) 636-9558	wanders@colleges.org
5.	Therese	Andersson	Dept. of EnergyMalardalens University	Box 883	Vasteras	72123	SE	+46 21-151753	+46 21-101370	theres.andersson@mdh.se
6. 7.	Eric Geoff	Annan Antrobus	Kumasi Polytechnic Rhodes University	HND Chemical Eng. Box 854	Kumasi Grahamstown	0000	GH RSA		0023351 20375	kafan@onebox.com g.antrobus@ru.ac.za
8.	Geertje	Appel	Vrije Universiteit Van Waarden Weten groep	FALW/DODe Boelelaan 1091	Amsterdam	1081 HV	NL	+31 204445351	31 20 4447123	g.appel@dienst.vu.nl
9.	Karin	Arvidsson	C/o sammalitso				Sweden			kas@hig.se
10.	Susan Patricia	Ballantyne	RMIT University	GPO Box 2476V	Melbourne	3001	Victoria Australia	+61 39925 4935	+61 396391941	Suzy.Ballantyne@rmit.edu.au
11.	Njogu	Barua	Eco News Africa				Kenya			enbarua@econewsafrica.org

12.	Charles	Bas oah	Ecosystem Regeneration & Social Development Association	P.O.Box GP 2381	Accra	00233	GH	00233-21-313608	00233-21-312457	erasda@hotmail.com
13.	Lauwan	Basson								
14.	Javier	Benayas-Del Álamo	UNIVERSIDAD AUTÓNOMA DE MADRID	OFICINA ECOCAMPUS. PABELLÓN B. CAMPUS DE CANTOBLANCO.	Ctra. de Colmenar.Km. 15,500. MADRID	E-28049	Spain	+34-91-397-80-14/51-38	+34-91-397-39-48	ecocampus@uam.es
15.	Peter Nicholas	Boateng	Ecosystem Regeneration & Social Development Association	P.O.Box GP 2381	Accra	00233	GH	00233-21-313608	00233-21-312457	erasda@hotmail.com
16.	Robert	Boschhuizen	Vrije Universiteit	de Boelelaan 1083a,	Amsterdam	1081HV	Holland	+31204449219		rbosch@bio.vu.nl
17.	Klaus	Bruun	N. Zahles College of Education	Linnesgrade 2	Copenhagen		Denmark	+45 3369 7900	+45 3369 7953	kbr@zahle.dk
18.	B	Coull								coull@environ.sc.edu
19.	Tzuchau	Chang	National Taiwan Normal University	No. 88, Sec. 4, Tin-Chou Rd	Taipei	116	Taiwan	886-2-29355232 ext. 10	886-2-29326359	tcchang@scc.ntnu.edu.tw
20.	Linda	Chalker-Scott	University of Washington, USA	P.O. Box 354115	Seattle	98195 4115	Washington USA	206 685 2595	206 6852692	lindacs@u.washington.edu
21.	Divine	Choe	CAMEROON AID ACTION FOR UNDERPRIVLGED AREAS(CAAAUPA-NGO)	PO BOX 6959 DOUALAP O BOX 290 BAMENDA	DOUALA	6959	LITTORAL CAMEROON	(237)7627039	(237)3403524	caaaupa2000@yahooo.com
22.		Chowdhury					Bangladesh			iedsfoeb@accesstel.net as
23.	Casius	Chuma	SEEDS	c/o H Kapadula ZRA	Lusaka	10101	Zambia	260-96-752040		chum@mail.ru

24.	Lindsay	Cole	Royal Roads University	481 Marine Drive	Gibsons British Columbia		CA	604 885 0877		
25.	Peter	Corcoran	**Florida Gulf Coast University**				USA			pcorcora@fgcu.edu
26.	Nicola	Corrigan	University of Hertfordshire	College Lane, Hatfield	Hertfordshire	AL 109AB	UK	+44(0)1707 284505	+44(0)17 07 2863183	n.l.1.Corrigan@herts.ac.uk
27.	Bruce	Coull	School of Environment University of South Carolina		Columbia	SC 29208	USA	803 777 9153	777 5715	coull@environ.sc.edu
28.	Caroline	Dahlbom	Swedish Ecodemics		Stockholm		SödermanlandSE	+46-(0)8-6414708		carolinedahlbom@hotmail.com
29.	Edmund Evans	Damen	Young Farmers Research & Dev Society	POBOX NT 60	Accra		Ghana	+233 24265262	+233 212314 85	youfardesghana@hotvoice.com
30.	Anja	De Groene	Hogeschool Zeeland, univ. of professional education	PO Box 364	Vlissingen	4380 AJ	NL	+ 31 118 489 224 or + 31 118 489 330	+ 31 118 489 239	groene@mail.hzeeland.nl
31.	Betty	de Keizer	Universiteit van Amsterdam	Spin 21	Amsterdam	1012 WX	Netherlands	+31 205254894	+31 205253270	bettyk@bdu.uva.nl
32.	M.G.	Devasahayam	Citizens' Alliance for Sustainable Living (SUSTAIN)	UN (Habitat) Center, V Floor, CMDA Towers, Egmore	Chennai (Madras)	600 008	India	++91-44-853 0802 ; 855 5834	857 2673	unchssp@md2.vsnl.net.in ; mgd@cyberwaveindia.com
33.	Don	Dippo	Fac of Education York University	4700 Keele Street	Toronto	LOG 1TO	Ontario CA	416 736 2100 ext 88791		ddippo@edu.yorku.ca

34.	Michael	Dombeck	Global Environmental Management Education Center,	Univ. Wisconsin-Stevens Point 1900 Franklin Street	Stevens Point	54481	Wisconsin US	(715) 346-3946	(715) 346-4554	Mike.Dombeck@uwsp.edu
35.	Sameul Confidence	Dotse	Hatof Foundation	P.O. Box CS 8257	Tema Greater Accra	233	GH	233 33 302047/300625	233 22 308943	csdotse@hotmail.com
36.	Peter	Downey	Sheffield Hallam University	City Campus Howard Street	Sheffield	S1 1WB	UK	0114225 4919	0114225 4948	P.Downey@shu.ac.uk
37.	Nico	Du Preez	Technicon Pretoria	P Bag X 680	Pretoria	0001	South Africa	012 318 5428	012 318 4115	Nico@techpta.ac.za
38.	Ing-Britt	Ek	Malardalens University IVF	Box 325, 63105	Eskilstuna		SE	+46 16153744	+46 16153744	Ing-britt@lizard.ru.ac.za ek@mdh.se
39. 40.	Abel Kaher Rosemary Mbonie	El-Zaemey Enie (Olive Akpon)	Hodiedah University	P.O.Box 13373	Sana'a	1	YE	967-1-204495	967-1-204495	zaemey@yahoo.com
41.	Mabel Aletta	Erasmus	Univ of Free State	P.O. Box 339	Bloemfontein	9300	ZA	051 4013732	051 448 3976	Erasmusm.hum@mail.uovs.ac.za
42.	Almerinda	Fadini	Universidade Sao Francisco	Rua Paraguai 513, ap.32 Jardim America	Indaiatuba	13330-000	Sao Paulo BR	55-19-38341533	55-11-40342344	almerindafadini@hotmail.com
43.	Cecilai	Fernström	Mälardalen University	Box 883	Västeras	S-72123	Sweden			c.fernstrom@mdh.se
44.	Didac	Ferrer-Ballas	Universidad Politechnica de Cataluna	Edifici A0(S201) Jordi Girona 1-3	Barcelona	E-08034	ES	34 93 413 7972	34 93 401 6500	coord.medi.ambient@upc.es didac.ferrer@upc.es
45.	Rob	Fincham	Centre for Environmental Management				South Africa	033 2605193 033 2606223		
46.	Patrick	Fitzgerald	UNIVERSITY OF THE NORTH	P/Bag X1106, Sovenga	Pietersburg	0727	ZA	+27-15-268 2140/2100	+27-15-267-0142	ptf@unin.unorth.ac.za

47.	LEWIS	FOFIE	KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOL.	P.O.BOX KS 1799, ADUM - KUMASI, GHANA	KUMASI		Ghana	00233-24-627247	00233-51-22926	lewisfofie@yahoo.co.uk
48.	Ana Rita	Fouto	Tecnologia da Universidade Nova de Lisboa	Campus da FCT - Edifício CEA - Sala 9A Quinta da Torre	Monte de Caparica	2825-114	Caparica	+351212948306	+351212948321	arff@fct.unl.pt
49.	Anna M	Geli	University of Girona	C/emili Grahit, 77	Girona	17071	Spain	+34972 418322	+34972 418301	Am.geli@vdg.es
50.	Bob	Gilmour	Glasgow Caledonian University	School of the Built and Natural Environment Cowcaddens Road	GLASGOW	G4 0BA	UK	0141 331 3571		r.a.gilmour@gcal.ac.uk
51. 52.	Marta Valeria Richard	Goenaga de Bedout Haverkamp	University leaders for a sustainable future Massey University	Secretarial Colombia ITE, Massey University Private Bag 11222	: Palmerston North		COLOMBIA. NZ	+646 350 4167	+646 350 5640	mvaleriag@cable.net.co r.haverkamp@massey.ac.nz
53.	Trevor	Hill	Discipline of Geography School of Applied Environmental Sciences					(033) 260-5235 083 650 0051	(033) 260-5344	Trevor Hill" <HillT@nu.ac.za
54.	João Luiz	Hoeffel	Universidade Sao Francisco	Rua Eunice Ferraz Fernandes 151 - CEP 12914-500 Bragança PaulistaEstrada do Ribeirão Acima 777 - Caixa Postal 20 - CEP 12960-970 - Nazaré Paulista	Bragança PaulistaSão Paulo	12914-500	Brasil	55-11-40342344	55-11-40342344	JoaoLuiz@saofrancisco.edu.br joaoluizhoeffel@hotmail.com

55.	Adv MC	Hoekstra	Technicon Free State	P/Bag X 20534	Bloemfontein	9300	South Africa	051 5073001	051 5007331 0	ntheron@tofs.ac.za
56. 57.	Charles H	Hopkins Huskoo	York University		Toronto		Canada			
58.	Hafiz M	Iqbal	Institute of Education and Research, Univ, of Punjab	University of the Punjab Quaid-e-Azam Campus,	Lahore	54590	Punjab Pakistan	+92 42 580044, 5834004	+92 42 5864004	hmiqbal@lhr.paknet.com.pk
59.	Peter	James	University of Bradford	15 Kestrel Close	Congleton	CW12 3FA	Cheshire UK	01260 290472		peter@dsl.pipex.com
60.	Cupido	Japhta	Univ of Free State	P.O.Box 339	Bloemfontein	9300	ZA	051 401 2474	051 4440740	Jafthacd.rd@mail.uovs.ac.za
61.	Charmaine	Johnson	Rhodes University	PO Box 94	Grahamstown	6140	ZA	046 6038429	046 6228960	c.p.johnson@ru.ac.za
62.	Paul W	Jowitt	Heriot Watt University	Edinburgh		EH14 4AS	UK	+44 (0)131 451 8147	+44 (0)131 451 8150	
63.	Merce	Junyent	University of Girona	C/emili Grahit, 77	Girona	17071	Spain	+34972 418322	+34972 418301	Merce.jumyent@vdg.es
64.	Arjan	Kirkels	Eindhoven University of Technology	Paviljoen A58 P.O. Box 513	Eindhoven	5600 MB	NL	+31 40 247 4463 / 3038	+31 40 243 9475	a.f.kirkels@tm.tue.nl
65.	Les	Kirkland	Potchefstroom Agricultural College					018 2996556		oplkirk@potch1.agric.za
66.	Charmaine	Klein	University of the Western Cape	Environmental Education & Resources UWC PB X17,	Bellville	7535	South Africa	021 - 959 2498	021 - 959 2484	cklein@uwc.ac.za
67.	Rudite	Klepere	Daugavpils University	Parades1,2120	Daugavpils	LV-5401	Latvia	371 5423468	371 5423468	rudite@nvo.dpunet.lv

68.	Dimby	Klinge	Foudation Sustainability for Higher Education	P.O. Box 501	Deventer	7400 AM	NL	+31 570 663038	+31 570 663713	d.e.klinge@saxion.nl
69.	Prof Albertus Sameul	Koorts	Technicon Free State	P/Bag X20539	Bloemfontein	9300	South Africa	051 5073001	051 5007331 0	akoorts@tofs.ac.za
70.	S Adebayo	Ladipo	Ademiran Ogunsana Coll of Educ.	Ijamikin PMB 007 Festac Town	Lagos		Nigeria	234 08023084820	+166145 23649	Bayoladipo2000@yahoo.com
71.	Prof. Laetus O.K. (PhD, DTh)	Lategan	Technicon Free State Dean: Research & Development	P/Bag X20539	Bloemfontein	9300	South Africa	051 5073001 051 5073336	+27 (0)51 507 3355	Llategan@tofs.ac.za
72.	Peter	Lent	University of Fort Hare	P/Bag x1314	Alice	5700	South Africa	082 391 0667	040 653 1730	plent@ufh.ac.za
73. 74.	Fransisco Dr M	Lozano Maharasoa	Technicon Free State	P/Bag X 20534	Bloemfontein	9300	South Africa	051 5073001	051 5007331 0	fjlozano@itesm.mx ntheron@tofs.ac.za
75.	Botshabelo	Maja	Human Sciences Research Council (HSRC)	Private Bag X41	Pretoria	0001	South Africa	012 302 2171	012 302 2553	BIMaja@hsrc.ac.za
76.	Ziole Zanotto	Malhadas	Universidade federal do Parana	R. Baroa de Campos Gerais, 524-Ap.51	Curitiba - P R	80030-400	Parana BR	55 41 2524461	5541 3102759	ziolezm@cwb.matrix.com.br
77.	Jabu	Maseko	University of South Africa	P.O. Box 30314, Sunnyside	Pretoria	0132	ZA	012) 429-4575	(012) 429-4922	masekjs@unisa.ac.za
78.	Coen	Meyer	Potchefstroom Agricultural College	P/Bag X 804	Potchefstroom	2520	SA	018 2996627	018 2933925	oplcjm@potch1.agric.za
79.	Maryna	Mohr-Swart	Environmental Sciences Technikon Pretoria	P/Bag X680	Pretoria	0001	ZA	012 - 318 6115 082 882 7700	012 318 6354	mohrm@techpta.ac.za engsim@pixie.co.za
80.	Benedict	Mokoena	Univ of Free State	P.O. Box 23160	Kagisanong	9309	ZA	051 4352902/3	051 4352841	mucpp@shisas.com

81.	Sys	Monique (c/o Waas)	Univ of Antwerp	Universiteitsplein 1Wilrijk - Antwerp	Wilrijk Antwerp	2610	BE	+32 3 820.21.31	+323 8202128	Monique.sys@ua.ac.be
82.	Nestor	Monroy	Universidad de los Andes		Bogota-Colombia		Colombia	571-3324320	571-3324321	
83.	John	Moore			New Jersey		USA			jmoore@bcit.cc
84.	Heidi	Muijen	Vrije Universiteit Amsterdam	De Boelelaan 1083a	Amsterdam	1081 HV	NL	31 20 4449219	31 20 444 9250	muijen@bio.vu.nl
85.	Mokubung	Nkomo	Human Sciences Research Council (HSRC)	Private Bag X41	Pretoria	0001	South Africa	012 302 2540	012 302 2553	Mnkomo@hsrc.ac.za
86.	Josef	Noeke	Universität Paderborn	Institut für Energie- und Verfahrenstechnik Warburger Str. 100	Paderborn	33098		+49 (0)5251 60-2406	-3207	josef.noeke@vt.upb.de
87.	EMMANUEL CHOUKWDI	NWOBU	CAMEROON AID ACTION FOR UNDERPRIVLGED AREAS(CAAAUPA-NGO)	PO BOX 6959 DOUALA P O BOX 290 BAMENDA	DOUALA	6959	LITTORAL CAMEROON	(237)7627039	(237)340 3524	caaaupa2000@yahooo.com
88.	E.T.	Nwosu	Ass for Sustainable Agriculture Developm. Res.	P.O.Box 22298 UI Post Office	Ibadjan	200005	Oyostate Nigeria	234 02 8104841	234 02 2414091	tirydoa@37.com
89.	Catherine	Odora-Hoppers	UP/HSRC	P O Box 117	Pretoria	0001	South Africa	0827738649		hoppodor@iafrica.com
90.	Michael	Okeowo		Sw7/206c sharp-corner, Oke-ado	Ibadan	23402	Oyo-state NG	234-2-2414151	234-2-2311739	mic4peace@hotmail.com
91.	Abiola	Olaniyi	2 Olufemi Road	Surulere	Lagos	234	NG	234 08023227513		abiolaniyi@yahoo.com
92.	A	Oluyemi	Ipokia Local Government	12 Sokenu Rd, Sapon	Abeokuta		NG	234 39245637	234 39240679	ipokia@weedmail.com
93.	M	Ortega								Morty.ortegauconn.edu

94.	Robert	Österberg	Swedish Ecodemics	Studentstaden 16, III	Uppsala	75332	SE	+46-(0) 18-2415		Robert.osterbergh@cemus.uu.se
95.	Dorcas	Otieno	Kenyatta University	Nairobi	Kenya					Dorcas Otieno [berylotieno@yahoo.com]
96.	Affum	Owuso	Felixwalters agency (GH) LTD	P.O.Box 719, Nungua EST	Accra	719	Ghana	023327875639	023321713645	Affum2000@yaho.com
97.	Martin	Palamuleni								
98.	Kesh Bahadur	Pariyar	Literary Academy for Dalit of Nepal	Thamel-29, P.O. Box 12134	Kathmandu	4977	Nepal	977-1-423367	977-1-426157	pariyarkb@hotmail.com ladnepal@hotmail.com
99.	Marc	Parren	University of Professional Education Larenstein	P.O.Box 9001	Velp	6880 GB	NL	+31 26 3695700	+31 26 3615287	Marc Parren [m.p.e.parren@larenstein.nl]
100.	Darathi	Patel								
101. 102.	Devendra Cristina	Pathak Pegado	Friends group of Jhapa (FHO-Jhapa) Faculdade de Ciências e Tecnologia - Universidade Nova de Lisboa	Rua Luís de Freitas Branco, nº 42, corpo B, 6ºB	Lisboa	1600-491	Nepal PT	977 1 471304 3351 21 294 83 74	977 1 494527 3351 21 294 83 74	cristinapegado@mail.fct.unl.pt
103.	Eduardo	Peris-Mora	Univ. Politechnica	Ciscar 61 16	Valencia	46005				eperis@cst.upv.es
104.	Jim	Petrie	Univ of Cape Town	Private Bag Rondebosch	Cape Town	7701	South Africa	021 650 4035	021 689 7579	petrie@chemeng.uct.ac.za smb@chemeng.uct.ac.za
105.	Victor	Phillips	Global Environmental Mangement Education Center, University of Wisconsin- Stevens Point	College of Natural Resources Univ. Wisconsin-Stevens Point 1900 Franklin Street	Stevens Point	54481	Wisconsin US	(715) 346-4617	(715) 346-4554	Victor.Phillips@uwsp.edu
106.	Rudi	Pretorius	Dept. Geography & Env. StudiesUNISA	P.O. Box 392	Pretoria	0003	zA	012 429 6527	012 429 6868	pretorw@unisa.ac.za
107.	Eddie	Quaye	Young Farmers Research & Dev Society	POBOX NT 60	Accra		Ghana	+233 24265262	+233 212314885	youfardesghana@hotvoice.com

108.	M.J	Ravindranath	Centre for Environment Education CEE	"Kamala Mansion" 143, Infantry Road,	Bangalore	560001	INDIA	91-80-2869094	91-80-2868209 91-80-2869907	raviatri@hotmail.com
109.	Nancy	Rolf	Emerald	60-62 Toller Lane	Bradford W Yorks	BD184PE	UK	(0)1274777700	(0)1274785200	nrolph@emeraldinsight.com
110.	Nico	Roorda	Brabant University of Professional Education	Beilerstroom 15	ER Tilburg	5032	NL	+31 13 4672239	+31 13 4686838	nrooda@wxs.nl
111.	Enie (dupl.)	Rosemary Olive Mbone	(TIES) Time & Tide International Education Services	P.O.Box 494	Ijanikin, Ojo Lagos	NG				tiesafrica@yahoo.co.uk
112.	Jacques	Roturier	ECOCAMPUS Universite Bordeaux 1	351 Cours de la LIBERATION Le Haut-Carre - 33405	TALENCE - Cedex		France	33 (0) 557 96 29 39 33 (0) 557 96 22 09	33 (0) 557 96 29 40	j.roturier@ecocampus.u-bordeaux.fr
113.	Klepere	Rudite	Daugavpils University	Parades 1 Daugavpils University	Daugavpils	LV-5400	Latvia	371 5428636 371 5422922	371 5422890	
114.	Reza	Salim	Bangladesh Friendship Education Society	1/11 Iqbal Road, Building 2, Dhaka	Dhaka	1207	Bangladesh	+8802 9124659	+8802 8114513	bfes@bdonline.com
115.	Ilga	Salitie	Daugavpils University	Parades1,221	Daugavpils	LV-5400	Latvia	37154 28636	371 5422890	ilga@dau.lv
116.	Antonijs	Salitis	Daugavpils University	Parades1,221	Daugavpils	LV-5400	Latvia	37 54 2597	371 5422890	antonijs@dau.lv
117.	OYEDELE OYEFEMI	SALIU	IFO LOCAL GOVERNMENT AUTHORITY	P.M.B 5023	Ogun State	234	NG	039 340018		ifolocalgovt@yahoo.com

118.	Musah Mohammed	Samba	Young Farmers Research & Dev Society	POBOX NT 60	Accra		Ghana	+233 24254334	+233 21231485	youfardesghana@hotvoice.com
119.	Kaisu	Sammalisto	Dean Env. Management Univ.Gävle	Institute of Technology 801 67	Gävle		Sweden	+46-26-648794 mobile: +46-70-6081333	+46-26-648828	kso@hig.se
120.	RAMON	SANS	UNIVERSITY POLITECNICH of CATALONIA	JORDI GIRONA, 31	BARCELONA	08014	ES	34 93 401 61 12	34 93 401 62 10	vre.sans@upc.es
121.	Ahmed	Saud	Assosiation for Creation of Employment	68/A Zaryab Colony Faqirabad # 2	Peshawar NWFP		Pakistan	092-91-285316, 092-303-7863616	092-91-845204	saud_shazi@yahoo.com
122. 123.	Emmanuel Tony,	Serwornu Shallcross	JITA-S.A Found. for Human Development Institute of Education, MMU	P.O.BOX MP 247 MAMPROBI Crewe Green Rd., CREWE CW1 5DU, UK.	ACCRA	233	GH UK	0023321316940 ++44 161 247 5030	0023321316940 ++44 161 247 6370	a.g.shallcross@mmu.ac.uk
124.	Constantina	Skanavis	C/o Hoefel				Greece			cskanav@agean.gr
125.	Ann	Smith	University of Hertfordshire	College Lane, Hatfield	Hertfodrshire	AL 109AB	UK	+4401707285252	+44(0) 1707 286313	m.a.smith@herts.ac.uk
126.	Bernadette	Snow	UPE Zoology Dept	P.O.Box 1600	Port Elizabeth	6001	SA	041 5042316	041 5042317	zlbbbs@zoo.upe.ac.za
127.	Manisha	Solanki	London School of Economics	House nr. 14 Patina Walk	London	SE16 5HT	UK	0044/20/7572 1138		m.solanki@lse.ac.uk
128.	Cristiane	Suarez	Universidade Sao Francisco	Rua Wilson Muner 186 – Jardim do Lago	Braganca Paulista	12900-000	Sac Paulo BR	55-11-40322975	55-11-40339849	veronatur@uol.com.bs
129.	Deepak	Subedi	Friends group of Jhapa (FHO-Jhapa)					977 1 471304	977 1 494527	Dusky@post.com

130.	Elsa Leonor	Talero	National Pedagogic University							elsatalero@yahoo.co.uk
131.	Ian	Thomas	School of Social Science and Planning RMIT	GPO Box 2476V,	Melbourne, Victoria	3001	Australia	+61 3 9925 3441	+61 3 9925 1855	ian.thomas@rmit.edu.au
132.	Thorben Birch	Thompsen			Copenhagen		Denmark			tbt@geogr.ku.dk
133.	Ingrid	Timmermans	RU Env Educ Unit	PO Box 94	Grahamstown	6140	South Africa	6038389	3631495	i.timmermans@ru.ac.za
134.	Muhamma d Ali	Tirmizi	National College of Arts	4 The Mall	Lahore	54000	PK	00-92-42-9210599/ 9210601 Ext:341	00-92-42-9210500	tirmizi@aaschool.ac.uk
135.	Azwinndini Christopher	Tshivhase	UNISA	P.O. Box 911-3439 Rosslyn	Pretoria	0200	ZA	0823755479		tshivac@unisa.ac.za
136.	arada	UGEL	free general students union ALGERIA	BP 377 DIDOUCHE MOURAD ALGER	ALGIERS	16200	ALGERIA	00213216367 51	0021321 636751	ugel2002@hotmail.com
137.	U D	Ulrich	Aalen University				DE			
138.	T Olalere	Usman	Ipokia Local Government	12 Sokenu Rd, Sapon	Abeokuta		Ogun State NG	234 39245637	234 3924067 9	ipokia@weedmail.com
139.	Marielle	van Tellingen	Scottish Institute of Sustainable Technology Heriot Watt University	Edinburgh		EH14 4AS	UK	+44 (0)131 451 8147	+44 (0)131 451 8150	m.van.tellingen@hw.ac.uk
140.	Jan Loius	Venter	Potchefstroom Agricultural College	P/Bag X 804	Potchefstroom	2520	SA	018 2996608	018 2933925	opljlv@potch1.agric.za
141.	Nguyen	Viet Thinh	Hanoi University of Educaion	Khoa Dia Ly Dai hoc Su pham Ha Noi	Ha Noi		Vietnam	84-4-8347 288		thinhhnpu@hn.vnn.vn
142.	Kristina	Von Oelreich	Märlardalens University	Box 883	Västerås	72123	SE	0046-021 103136	0046-021 101370	Kristina.von.oelreich@mdh.se

143.	Tom	Waas	Univ of Antwerp	Universiteitsplein 1Wilrijk - Antwerp	Antwerp	2600	BE	+32 3 820.21.35	3238202 128	tom.waas@ua.ac.be
144.	Mary	Webb	Oxford Brookes University	Gipsy Lane Headington	Oxford	OX3 0BP		01865 483296	01865 483242	mwebb@brookes.ac.uk
145.	R	Wemmenhove	Universiteit van Amsterdam	ECDO/Milieukunde (B315) Nieuwe Achtergracht 166	Amsterdam	1018 WV	Netherla nds	+31 (0) 20 - 525 6268	+31 (0) 20 - 625 8843	wemmenhove@science.u va.nl
146.	Basie	Wessels	Univ of Free State	P.O. Box 339	Bloemfontein	9300	ZA	051 5229413	0510544 40740	basiew@mweb.co.za
147.	Johan	Woudstra	Technical Highscool Rijswijk	Lange Kleiweg 80	Rijswijk ZH	2288 GK	NL			wa@thrijswijk.nl
148.	AUGUSTIN E	YEBOAH	UNIVERSITY OF CAPE COAST	BOX 40,NEW EDUBIASE BOXCT 1847,CANTOMEN T	ACCRA	233	GH	233-024-204075/233-882-2666	233-63235	yeboakgh@yahoo.com
149.	Emmanuel	Yormedan								yormedan@yahoo.com
150.	Fred	Zoller	Technical Highschool Rijswijk	Lange Kleiweg 80	Rijswijk	2288 GK	Z.H. NL			zo@thrijswijk.nl

Return to Contents