

**LEAN SUPPLY CHAIN MANAGEMENT PRACTICES AND  
ORGANIZATIONAL PERFORMANCE IN THE PUBLIC  
WATER SECTOR IN KENYA**

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## **DECLARATION**

This research project is my original work and as not been presented for a degree in any other university.

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This research project has been submitted for examination with my approval as a University Supervisor.

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## **DEDICATION**

This project is dedicated to my family who have been my key asset to success and supported me both emotionally and financially during the time of the project. I sincerely appreciate their support and prayers that led to the completion of this project within the stipulated timeframe.

## **ACKNOWLEDGEMENT**

Above all, I thank God for His Grace, provision and seeing me through the project. My special gratitude goes to my supervisor Onserio Nyamwange who tirelessly through his effort and initiative guided me through the whole process. I would like to acknowledge all the MBA students, colleagues, friends and my family especially for their moral and material support for the completion of this project.

## **LIST OF ABBREVIATIONS AND ACRONYMS**

CPFR	Collaborative Planning, Forecasting, and Replenishment
MVA	Market Value Added
ROI	Return on Investment
SCM	Supply Chain Management
TPS	Toyota Production System
WSBs	Water Service Boards
WSPs	Water Service Providers
WSRB	Water Services Regulatory Board

## ABSTRACT

In the competitive environment, most leading edge companies realized that by transferring costs either upstream or downstream, they are actually not increasing their competitiveness, since all costs ultimately make their way to consumers. Supply chain management guides firms to co-operate with a common goal to increase the overall channel sales and profitability, rather than competing for a bigger share of a fixed profit. One strategy for coordinating within and between firms with a focus on achieving efficiency, eliminating waste or overburden and creating value in products is the concept of lean management. The purpose of the study was to assess the lean supply chain management practices and organizational performance in the public water sector in Kenya. The variables under study were demand management practices, Waste management practices, Standardization practices and Behavioral practices. This study adopted a descriptive survey research design and both qualitative and quantitative data will be obtained for comparison purposes. The target population for the study was the 117 Water Service Providers (WSPs) which were linked to 8 regional Water Services Boards (WSBs) in charge of asset management through Service Provision Agreements (SPAs). In this study, primary data was collected by use of structured and closed ended questionnaire. Questionnaires were sent through the email to majority of the respondents and the researcher made phone calls to encourage the respondents to fill in the questionnaire and email back. The study established that demand management was concerned with balancing the requirement of internal and external customers with supply chain capabilities. The study also found out that the firm has small specialized plants rather than vertically integrated manufacturing facilities, the firm encourages doing the right thing the first time, the firm produces what is needed and no more (JIT) and that the firms production flow is smooth to dampen reaction waves that occur in response to schedule variations. The study concluded that the lean supply chain practices used by the public water companies in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, inspection activities and assurance activities. The study concluded that the companies have been embracing lean supply chain management strategies despite the challenges experienced form the internal and external environment. Lean supply chain management strategies have assisted the water companies to enhance their performance.. To gain competitive edge, public water companies in Kenya have no choice other than implementation of the lean strategies for survival. The study recommends that the companies should invest in time and money in collaborative demand planning, the firms should communicate its demand forecasts to its supply chain partners. The study recommends that the companies should practice the philosophy of grouping similar parts in families to eliminate movement and queue. The study recommends that the firm should have standardized and rationalized the range of materials, parts and consumables.

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# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Supply chain has become a vital entity to the organizations performance measurement and metrics and has received much attention from researchers and practitioners. To support this, Gunasekaran, Patel (2011) and McGaughy (2009) have discussed that the role of these measures and metrics in the success of an organization cannot be overstated because they affect strategic, tactical and operational planning and control. Some more, the revolution of SCM in the last decade has testified that an increasing number of companies seek to enhance performance beyond their own boundaries (Boyson et al., 2010). Supply chain has been viewed on every perspective. According to Agarwal and Shankar (2012), a supply chain is an inter-linked set of relationships connecting customer to supplier, perhaps through a number of intermediate stages such as manufacturing, warehousing and distribution processes.

In the competitive environment, most leading edge companies realized that by transferring costs either upstream or downstream, they are actually not increasing their competitiveness, since all costs ultimately make their way to consumers (Cozzi and Perona, 2012). Hence, supply chain management guides firms to co-operate with a common goal to increase the overall channel sales and profitability, rather than competing for a bigger share of a fixed profit. One strategy for coordinating within and between firms with a focus on achieving efficiency, eliminating waste or overburden and creating value in products is the concept of lean management (Womack and Jones, 2009). Consequently, Vonderembse et al., (2012), highlighted on the strategies and methodologies for designing supply chains that meet specific customer expectations.

According to them, three different types of supply chains can be defined: A lean supply chain, which employs continuous improvement efforts which focuses on eliminating waste or non-value steps along the chain; an agile supply chain, which responds to rapidly changing, continually fragmenting global markets by being dynamic, context-specific, growth-oriented, and customer focused and a hybrid supply chain, which combines the capabilities of lean and agile supply chains to create a supply network that, meets the needs of complex products.

Lean thinking is focused on eliminating waste from all processes while enhancing material and information flow along the supply chain (McManus, 2012). The impact of lean thinking as a strategy for the supply chain and not just manufacturing is important and has received a lot of interest from both industry (including service) and academia. Hence, the purpose of this study is to explore the lean supply chain management practices in the water sector in Kenya, and identifies the effects of these practices on organizational performance.

Water companies in Kenya are facing challenges in the supply chain due to influence of technology and globalization. Due to these challenges, the performance of the organization has decreased tremendously due to inefficient and ineffective customer relationship strategies, customer service management, and demand management and supplier relationship (Lysons and Farrington, 2010). Generally, in terms of performance, and improvements water companies are far behind and transferring lean management concept from the services might offer opportunities for improvements. Many service businesses have improved and profited by the use of lean management methods and tools.

Yet the benefits have not been as nearly as impressive for service industries applying lean management principles (Agus, 2012).

### **1.1.1 Lean Supply Chain Management Practices**

Lean is a systematic approach to identifying and eliminating waste (non-added activities) through continuous improvement by following the product at the pull of the customer in pursuit of perfection” (The National Institute of Science and Technology) Simply lean means to create more value for customers with fewer resources, thus the fundamental idea is to maximize customer value while minimizing waste. Wu and Wee (2009) concluded that the term lean means a series of activities or solutions to eliminate waste reduce non-value added operations and improve the value added operation. Supply chain management (SCM) is the term used to describe the management of the flow of materials, information, and funds across the entire supply chain, from suppliers to component producers to final assemblers to distribution (warehouses and retailers), and ultimately to the consumer (Jørgensen and Emmitt, 2009). Briefly, a supply chain is a collaboration of network of retailers, distributors, transporters, storage facilities, and suppliers that participate in the production, delivery, and sale of a product to the consumer. It is essentially made up of multiple companies who coordinate activities to set themselves apart from the competition (Kouvelis, 2011).

This value added and non-value added concept were derived mainly from Toyota Production System (TPS) which highlighted eight forms of waste: Overproduction, waiting, conveyance, over-processing, excess inventory, movement, defects and unused employee creativity (Liker, 2014). A lean organization understands customer value and focuses its key process to continuously increase it. The ultimate goal is to provide perfect

value to the customer through a perfect value creation process that has zero waste. To make lean process success, level of thinking needs to be changed in order to focus on management from optimizing separate technologies, assets and vertical department to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets and departments to customers (Lee, 2014). Eliminating waste along entire value streams, instead of at isolated points, creates processes that need less human effort, less space, less capital and less time to make products and services at far less cost and with fewer defects, compared with traditional business systems. Companies are able to respond to changing customer desires with high variety, high quality, low cost and with very fast throughput times.

Agus and Hajinoor (2012) emphasized that the theory and principles of lean and its associated tools, practices and procedures can be extended outside the boundaries of an organization to its supply chains. However, the concept of lean supply chain was proposed in 1994, when the proponents of lean manufacturing, Womack and Jones (2012) envisioned the concept of “Lean enterprise”. Bodognz (2012) emphasized that the success of lean supply chain management principles is derived from ten basic lean principles : focus on the supplier network value stream, eliminate waste, synchronize flow, minimize both transaction and production costs, established collaborative relationships while balancing cooperation and competition, ensure visibility and transparency, develop quick response capability, manage uncertainty and risk, align core competencies and complementary capabilities and foster innovation and knowledge sharing; building and maintaining a lean supply revolves around four key practices. Mastering the four practices leads to a lean and effective supply chain (Norek, 2012).

They are demand management practices, waste management practices, standardization practices and behavioral practices.

### **1.1.2 Organizational Performance**

Organizational performance refers to how well an organization achieves its market-oriented goals as well as its financial goals (Lysons and Farrington, 2006). The short-term objectives of SCM are primarily to increase productivity and reduce inventory and cycle time, while long-term objectives are to increase market share and profits for all members of the supply chain (Ketchen & Hult, 2010). Financial metrics have served as a tool for comparing organizations and evaluating an organization's behavior over time. Any organizational initiative, including supply chain management, should ultimately lead to enhanced organizational performance.

A number of prior studies have measured organizational performance using both financial and market criteria, including return on investment (ROI), market share, profit margin on sales, the growth of ROI, the growth of sales, the growth of market share, and overall competitive position (Lambert, 2012). In line with the above literature, the same items will be adopted to measure organizational performance in this study.

### **1.1.3 Public Water Companies in Kenya**

Kenya's national policy on Water Resources Management and Development published in 1999 addresses the main principles of the IWRM approach and recommended the drafting of a new Water Act. The new Water Act was promulgated in 2002 and provides a legal basis for the reform of the water sector. An essential aspect of the reform in the water sector outlined in the Water Act 2002 is the separation and decentralization of roles

and responsibilities of water services and water resources management, creation of new institutions and stakeholder participation. The new governance structure was meant to remove bottlenecks in the national water administration and improve efficiency in service delivery.

The Water Act of 2002 established Water Service Boards (WSBs) to be responsible for providing water and sanitation services. Seven regional WSBs have been established. The Boards manage water services assets and ensure that they remain in the public realm. Overall supervision of water services is consequently being carried out by the Water Services Regulatory Board (WSRB), the organ responsible for regulating the services supplied by the WSBs and their providers.

The Kenyan water sector underwent far-reaching reforms through the Water Act No. 8 of 2002. Previously service provision had been the responsibility of a single National Water Conservation and Pipeline Corporation as well as of a few local utilities established since 1996. After the passage of the act service provision was gradually decentralized to 117 Water Service Providers (WSPs). These are linked to 8 regional Water Services Boards (WSBs) in charge of asset management through Service Provision Agreements (SPAs). The Act also created a national regulatory board (WASREB) that carries out performance benchmarking and is in charge of approving SPAs and tariff adjustments. The Ministry of Water and Irrigation is in charge of policies for water supply and the Ministry of Public Health and Sanitation is in charge of policies for sanitation.

The established water sector institutions include: Water Services Regulatory Board (WASREB) to set standards and regulate the sub-sector; Water Appeal Board (WAB) to adjudicate on disputes; Seven Water Services Boards (WSBs) to be responsible for the

efficient and economical provision of water services; Water Services Trust Fund (WSTF) to finance pro-poor investments. Water Services Providers (WSPs) to be agents in the provision of water and sewerage services; Water Resources Management Authority (WRMA) to manage and protect Kenya's resources; Catchment Area Advisory Committees (CAAC) support the WRMAs at the regional Level and Water Resource Users Associations (WRUA) established as a medium for cooperative management of water resources and conflict resolution at sub-catchment level.

Water Resource Management Authority (WRMA) is the body responsible for sustainable management of Kenya's water resources. It is expected to implement the policies and strategies relating to water resource management and for developing guidelines and procedures for allocation and monitoring of water catchment protection and management.

Water Services Regulatory Board (WSRB) is the body responsible, on behalf of the government (MWI), for the regulation of water and sewerage services including licensing, quality assurance, and issuance of guideline on tariffs, prices, and disputes resolution. Water Service Boards are the implementing agencies of the directives of WSRB as they are charged with the efficient and economical provision of water and sewerage services in their respective areas of jurisdiction.

## **1.2 Statement of the Problem**

There has been a drastic increase in the pressure on organizations to find new ways to create and deliver value to customers with fewer resources or to maximize customer value while minimizing waste for improvements in profitability and reduced costs in the supply chain. Firms face an increasing pressure of customer requirements while at the same time need to reduce cost, shorten lead times and lower inventory levels to ensure

profitability (Holweg, 2005). The need for lean supply chains to become responsive arises from internal factors such as target costing, use of value engineering, use of cross functional teams, just in time and zero defective products (Lysons and Farrington, 2013) as well as external factors such as customer lead times, demand specification, product variety, product life cycle, order to delivery time and distribution lead time (Reichhart and Holweg, 2013). Supply chain responsiveness relates directly with business performance, increases revenues, lower costs, leads to customer satisfaction and loyalty hence increased profits in the long-run and thus motivates both researchers and practitioners to explore the area (Mageto, 2009).

Several studies have been done on lean supply chain. Larson (2014) carried out a study on the implementation of lean practices in the United States of America; Daud and Zailani (2011) did a research on lean supply chain practices and performance in the context of Malaysia and found out that lean supply chain practices are directly related to the performance of the electrical, electronics and electronics manufacturing service companies in Malaysia; Mageto (2009) studied on the relationship between supply chain performance and supply chain responsiveness in supermarkets in Nairobi and found out that supply chain performance and supply responsiveness, reliability, flexibility and timeliness indicate very strong relationship with supply chain performance. While Karoki (2014) did the application of lean thinking to business process management and found out that lean management and application of related tools, equipment and techniques is a continuous process at Kenya Revenue Authority highly driven by the need to improve service delivery and tax collection while netting those evading taxes. Other local studies carried out in Kenya by (Wainaina, 2009) and Ngonjo, (2014) on supply chain management

strategies and performance of commercial entities observed that organizations in Kenya were yet to fully embrace the supply chain management strategies and most of the practices used were borrowed from the procurement philosophy. The study sought to fill the gap by answering the following questions; which supply chain management practices are used in the water sector in Kenya and what is the relationship between lean supply chain management practices and organizational performance in the water sector in Kenya?

### **1.3 Objectives of the Study**

The objectives of the study were:-

- i. To determine the extent of lean supply chain management practices in the water sector in Kenya
- ii. To determine the relationship between lean supply chain management practices and organizational performance in the water sector in Kenya

### **1.4 Value of the Study**

The findings of this research would enable the academicians/researchers in broadening of syllabus with respect to the effects of lean supply chain in organization performance. The results would also assist firms and their employees in improving their lean supply chain practices with regard to demand management, inventory management, waste management and continuous improvement on the performance of Water companies in Kenya.

The research findings are expected to contribute to a better understanding of lean supply chain management on the performance of Water companies in Kenya. It would help various shareholders to make strategic lean decisions in procurement, marketing Human

Resource management and distribution in order to survive in the competitive industry. Water companies in Kenya would gain an In-depth understanding on how to meet customer needs cost effectively thus zero waste tolerance. Innovative ways of satisfying customers would be established.

The Government would be in a position to formulate lean policies that are aimed at increasing productivity and safeguarding the interests of organizations in Kenya based on lean practices on customer satisfaction.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter introduces the review of the contextual and theoretical literatures relating to lean supply chain on organization performance with the aim to document the critical point knowledge; it further discusses the perspectives of supply chain performance and attempt made in this line by other scholars.

### **2.2 Theories**

The study will be guided by institutional theory, resource dependence theory and transaction cost theory which is discussed below.

#### **2.2.1 Institutional Theory**

Institutional theory examines how external pressures influence a company (Hirsch, 1975). Within institutional theory, there are three forms of isomorphic drivers namely, coercive, normative, and mimetic (Dubois and Pedersen, 2004). Coercive isomorphic drivers occur from influences exerted by those in power. Institutional theory can be used to study how a company addresses green issues due to external pressures (Zhu and Sarkis, 2004), and thus institutional theory has become a major research direction to explain environmental related practices (Lummus, 1997). Government agencies are an example of powerful institutions that may coercively influence the actions of an organization through, for example, fines and trade barriers (Rivera, 2004). Normative isomorphic drivers cause enterprises to conform in order to be perceived as having legitimate organizational activities. Social normative pressures can explain environmental management practices among enterprises (Ball and Craig, 2010). Mimetic isomorphic drivers occur when

enterprises imitate the actions of successful competitors in the industry, in an attempt to replicate the path of their success (Awin, 2006).

Coercive pressures are key to drive environmental management (Dubois, 2002). Previous studies show that governments are key groups to promote voluntary environmental management practices (Rivera, 2004). In developed countries such as the U.S.A., coercive pressures through laws and regulations were demonstrated to improve environmental awareness, and thus drive environmental management practices. Coercive pressures by governments were shown to drive enterprises to adopt voluntary green initiatives while such pressures become weaker for those rich in organizational resources for environmental strategies (Clemens and Douglas, 2006). Regulations in developed countries have also caused an increase in institutional pressures for improved environmental management by enterprises in developing countries, many typically surpassing local requirements. Developing countries such as China have enacted increasingly strict environmental regulations which drive manufacturers to implement GSCM practices (Zhu and Sarkis, 2004).

Socially related requirements such as those from the customer and market and their increasing environmental expectation form the core normative pressure for manufacturers to implement GSCM. In developed countries, consumers have increasing environmental awareness. Thus, normative social pressures in developing countries such in Africa continent are found to be mainly originated from consumers' ethical values and ecological thinking (Bodognz, 2010). Previous studies show that consumers in developing countries have increasingly heightened environmental awareness and are starting to opt for green products (Hines, 2006). In addition to normative pressures from

consumers, exports and sales to foreign customers are two more important drivers that prompt manufacturers to adopt GSCM practices for developing countries such as China (Cigolini et al., 2014).

Organization may follow or ‘mimic’ competitors merely because of their success, where such behavior in operations and manufacturing is typically defined as competitive benchmarking. The rationale is simply to follow the actions of successful competitors to replicate their successful paths. Imitation plays a significant role for enterprises in developed countries such as Canada, France, and Germany to implement GSCM related practices (Agarwal, 2006). Globalization has created opportunities for manufacturers in developing countries such as China to learn from their foreign competitors to implement environmental management practices (Cozzi and Perona, 2012). Joint ventures in a developing country may implement GSCM practices such as eco-design by imitating their parent companies, and then diffuse their experiences to other enterprises in the developing country (Zhu and Liu, 2010). Institutional theory, examining the causes of isomorphism within organizations, provides an alternative viewpoint to the adoption of strategies and practices in managing operations and supply chains. Applications have so far been limited to few topics, such as quality management and adoption of electronic tools. This study aims to contribute to an increased understanding of the theory's explanatory value in the field by presenting central research avenues yet unexplored.

### **2.2.2 Resource Dependence Theory**

Resource dependence theory (RDT) suggests that, in the supply chain, member firms should be dependent and collaborate to seek higher performance gains in the long-run

instead of pursuing short-term benefits at the expense of others. In RDT, firms are dependent on resources provided by others in order to sustain growth, as well as other organizations who may be dependent on them (Prater, 2011). One important assumption of the RDT is that firms cannot be fully self-sufficient with regards to strategically critical resources for survival. In SCM, eco-design of products and materials recovery are exemplary organizational resources requiring supply chain partnership to effectuate performance benefits (Simone et al., 2010). These resources can also be converted to relationship-specific assets, similar to those identified in transaction cost economics, on which partner firms depend to generate sources of advantages. On the other hand, firms need to control or access critical resources e.g., standards, procedures, enabling technologies, materials sources, and distribution channels, to implement SCM practices and fully realize the potential gains.

The interdependency of supply chain partners as well as the quality and effectiveness of their collaboration that determine the success of implementing SCM should not be ignored. One important insight from RDT is that firms lacking the required resources to attain their goals are likely to develop relationships with others for acquisition of the resources. This perspective considers customer and supplier relationships as important linkages for firms to reduce the uncertainty surrounding their operating environment (Togar and Ramaswami, 2014). In many instances, inter-organizational relationship is essential for managing the internal and external coordination for SCM to gain the performance outcomes (Zhu, 2004), where partner coordination and resources sharing are beneficial for environmental and productivity improvements. The power development aspect of resource dependence argues for the diffusion of environmental practices

through the supply chain. For example, it has been found that larger firms, given their power over smaller firms, will require environmentally sound practices to be adopted by small supplier firms (Rivera et al., 2004).

There is empirical evidence showing a positive relationship between resources dependency and supply chain performance (Lysons, 2008). Though there is a void of studies relating RDT to SCM, this theory is valuable for extending this line of research in understanding inter-organizational behaviors in SCM implementation. For instance, it helps to predict organizational responses for implementing SCM with respect to the level and nature of dependence of partner firms and their relative power in the supply chain. In adopting SCM practices, e.g., green purchasing and customer cooperation, this theory provides insights on how to facilitate and improve the resources acquisition process considering the dependency of upstream and downstream supply chain partners.

### **2.2.3 Transaction Cost Theory**

Asset Specificity, Frequency of economic exchange and Uncertainty represent core dimensions of a transaction. Composition of these dimensions is decisive for the way to assign cost efficient governance modes to a transaction taking into consideration human beings have bounded rationality and have opportunistic tendencies. What makes managing any supply chain difficult is uncertainty. So firms assign specific governance forms like conventional market contracts, inter-firm coordination or vertical integration based on economizing transaction costs considering the core dimensions.

In these relationships amongst the firms, the complexity of transactions increases as involved parties like ground handlers like amusement and recreation providers etc. make

more idiosyncratic investments that cannot be re-deployed easily for other purposes, such as the training of personnel, customizing products, investing in inter-organization systems etc.. The challenge for these inter-firm relationships is to design and implement a governance structure that creates sufficient coordination in order to reach desired outcomes at lowest possible cost (Buvik & Haugland 2005). In such a case, such an organization's integration efforts need to be protected. Considering bounded rationality, the hybrid mode (e.g. bilateral contracting) or internal organization (hierarchy) will provide higher governance performance when asset specificity becomes substantial (Buvik & Reve, 2002). When uncertainty is perceived as significant contracting hazards, then hierarchies would be preferred via vertically integrating than inter-firm coordination. Hybrid arrangements (e.g. cooperative arrangements) are likely to possess an insufficient authority structure to vertically or horizontally coordinate (Buvik & Grønhaug, 2002). Considering these uncertainties and level of asset specificity, the right governance mechanism needs to be in place. What transaction cost theory does is to encourage firms to “look ahead, perceive hazards and factor these back into the contractual relation”. (Williamson, 1996)

### **2.3 Lean Supply Chain Management Practices**

Implementing lean concepts means breaking old patterns and installing new ones. To accomplish this, an organization needs a whole new set of tools and a framework for applying them. Lean processes merge several elements to form an integrated whole, which aligns the various parts of an organization to make a change of great magnitude (Ketchen and Hult, 2010). Lean companies work cooperatively with their customers. Creating high levels of value often requires close relationships with the customers. Value

is often added more by the additional services and close cooperation than by the attributes of the products themselves (Ketchen and Hult, 2010).

Service quality is perceived by customers is the extent of discrepancy between customer's expectations and their perceptions of actual service performance (Simchi-Lev and Kaminsky, 2012). This implies that quality of a service is very subjective and cannot be grasped in easy indicators like in manufacturing. However some dimensions of quality in service operations can be described as tangibles, reliability, responsiveness, assurance and empathy (Cooper, Lambert, and Pagh, 2012). In order know the dimensions classification can help to organize and structure the different aspects, which need to be considered for the management of services. There are many ways to structure the manifold types of services offered in the market (Schonberger and Richard, 2007). Services can be roughly categorized in personal services, infrastructure services, distribution services, government services, business services, manufacturing services, and value added services. Generally, Lean approach is a systematic approach to identify and eliminate elements of a process that do not add value to the final outcome of the process (Kallrath, and Maindl, 2006). Lean can be seen as a concept addressing the quality, cost and delivery of a company's business processes by using an integrated set of principles, methods and tools.

Furthermore, Lean is a philosophy of leadership, teamwork and problem solving, resulting in a process of continuous improvement throughout the entire organization by focusing on the needs of the customer, empowering employees. Thus lean centers the process that delivers and is less about its final outcome, the actual product or delivery respectively (Schonberger and Richard, 2007). Furthermore, services can be

distinguished according to the degree of customer involvement and repeatability of tasks performed in service production. Schemmer proposed the service process matrix to demonstrate that service management problems are common among different service industries (Schemmer, 2013). Within this matrix, services are classified according to two dimensions that significantly affect the character of the service production and delivery process. The repeatability on the ordinate is considered from the service organization's point of view and refers to similarity by stage rather than by individual customer (Lavassani, Movahedi and Kumar, 2009).

While the broad stages may have high repeatability, the detailed tasks to be done may be very dissimilar. On the abscissa customer involvement refers to the frequency with which service providers get in contact with the actual (external) customers. It does not take into account the length of contact between provider and customer; rather it describes the ability of the customer to affect the nature of the service being delivered personally. The boundaries in this figure are not as strict as displayed. In reality they are fuzzy and can be considered as continuous spectrums (Simchi-Lev and Kaminsky, 2007). Service organizations require special management approaches that go beyond simply adapting management techniques prevailing in manufacturing organizations. The distinctive characteristics discussed above enhance the view to managerial service approaches to a systems view including the customer as a participant in the service process.

Thus the customer should be considered as an input that is being transformed by the service process into an output with some degree of satisfaction (Locher, and Drew, 2007). The position of a service operations manager includes both production and marketing in an open system with the customer as a partner in the value creation process. The

traditional manufacturing separation of the production and marketing functions with finished-goods inventory as an interface is neither possible nor appropriate in service organizations. By necessity, the operations and marketing functions are integrated for service organizations (Simchi-Lev and Kaminsky, 2007).

Lean supply chain management comprises various elements that are integrated for efficiency and effectiveness of the organization. Both elements should be present for any lean enterprise firm in the modern context. Competitive firms need to understand and measure the extent to which each element adds value in the supply chain (Kallrath and Maindl, 2010). Components of lean supply chain include; lean suppliers, lean procurement, lean manufacturing, lean warehousing, lean transportation and lean customers. According to Lambert, (2012) lean suppliers are able to respond to changes. Their prices are generally lower due to the efficiencies of lean processes, and their quality has improved to the point that incoming inspection at the next link is not needed.

Demand management is concerned with balancing the requirement of internal and external customers with supply chain capabilities. It includes forecasting demand, synchronizing supply and demand, increasing flexibility, reducing the variability of demand by means of standardization and the control of inventory (Lysons and Farrington, 2006). Demand management practices include: planning demand, communicating demand, influencing demand and managing and prioritizing demand. Planning demand involves more than just forecasting. Proposed in 1995, Collaborative Planning, Forecasting, and Replenishment (CPFR) has evolved into a Web based tool to coordinate demand forecasting, production and purchase planning, and inventory replenishment

between supply chain partners. CPFR is used as a means of integrating all members of an *n*-tier supply chain, including manufacturers, distributors and retailers.

Waste, as defined by Toyota's past President, Fujio Cho, is anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production, and the seven types of waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects. Value chain mapping is a great way to analyze existing processes and the practice to waste management include having focused factories networks, employing Group Technology (GT), practicing quality at source. JIT production, uniform plant loading, Kanban production control system and minimizing set-up times (Aquilano et al., 1995).

Standards are documents that stipulate or recommend minimum levels of performance and quality of goods and services and operational conditions in a given environment. They help clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and reduce cost of material handling (Lysons and Farrington, 2006). Practices include variety reduction, quality assurance and quality control. Variety reduction can make substantial saving in inventory by standardizing and rationalizing the range of material, parts and consumables and has the benefits of reducing of holding costs for stocks, release of money tied up in stock, easier specification when ordering, narrows range of inventory and reduces supplier base. Quality assurance refer to those planned and systematic activities implemented within the quality systems and demonstrated as needed to produce adequate confidence that an entity will fulfill requirements for quality and is concerned defects

prevention involves a number of approaches: quality systems (ISO 9000), new design control, design for manufacturing processes, incoming material control and supplier appraisal (BS EN ISO 8402, 1995).

Supply chain partners from upstream suppliers to downstream customers must collaborate as a team to provide value to the end user. Organizational behavior is the study of the structure, functioning and performance of the organization, and the behavior of groups and individuals within them. Best in class behavioral practices include job enrichment, multiple career ladders, high employee participation, many and flexible incentives and quality of work life emphasis (Huczyski and Buchanan, 2002).

## **2.4 Organizational Performance**

Performance involves the accomplishment of a given task measured against preset known standards. It would be expected that overall performance determines an organizational survival. It is a set of metrics used to quantify both the efficiency and effectiveness of actions. Performance measurement framework proposed by Kallrath and Maindl (2010) balanced scorecard which is based on the principle that a performance measurement system should provide managers with sufficient information to address the questions: how do we look to our shareholders (financial perspective)?, what must we excel at (internal business perspective)?, how do our customers see us (customer perspective)? and how can we continue to improve and create value (innovation and learning perspective)? Lean supply chain performance measurement will be measured in terms of minimal customer complaints, reduced costs of production, Just- In time customer service, minimal paper work, minimal employee contact with customers, increased online

response, increased electronic transactions and continuous improvement of internal processes (Mentzer, 2011).

Mentzer (2011) contends that, performance is measured by either subjective or objective criteria; arguments for subjective measures include difficulties with collecting qualitative performance data from small firms and with reliability of such data arising from differences in accounting methods used by firms. Objective performance measures include indicators such as profit growth, revenue growth, return on capital employed. Financial consultants Stern Stewart and Co. created Market Value Added (MVA), a measure of the excess value a company has provided to its shareholders over the total amount of their investments. This ranking is based on eight more traditional aspects of financial performance including: total return for one and three years, sales growth for one and three years, profit growth for one and three years, net margin, and return on equity.

## **2.5 Lean Supply Chain management Practices and Organizational Performance**

Lean is defined as a “Systematic approach to identifying and eliminating waste (non-added activities) through continuous improvement by following the product at the pull of the customer in pursuit of perfection” (The National Institute of Science and Technology, 2010). Simply lean means to create more value for customers with fewer resources, thus the fundamental idea is to maximize customer value while minimizing waste. Wu and Wee (2009) concluded that the term lean means a series of activities or solutions to eliminate waste reduce non-value added operations and improve the value added operation.

This value added and non-value added concept were derived mainly from Toyota Production System (TPS) which highlighted eight forms of waste: Overproduction,

waiting, conveyance, over-processing, excess inventory, movement, defects and unused employee creativity (Monden, 1998; Liker, 2004). A lean organization understands customer value and focuses its key process to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste.

Anand and Kodali (2008) emphasized that the theory and principles of lean and its associated tools, practices and procedures can be extended outside the boundaries of an organization to its supply chains. However, the concept of lean supply chain was proposed in 1994, when the proponents of lean manufacturing, Womack and Jones (1994) envisioned the concept of “Lean enterprise”. Bozdogan (2002) emphasized that the success of lean supply chain management principles is derived from ten basic lean principles : focus on the supplier network value stream, eliminate waste, synchronize flow, minimize both transaction and production costs, established collaborative relationships while balancing cooperation and competition, ensure visibility and transparency, develop quick response capability, manage uncertainty and risk, align core competencies and complementary capabilities and foster innovation and knowledge sharing; building and maintaining a lean supply revolves around four key practices. Mastering the four practices leads to a lean and effective supply chain (Norek, 2002). They are demand management practices, waste management practices, standardization practices and behavioral practices.

Organizational performance refers to how well an organization achieves its market-oriented goals as well as its financial goals (Lysons and Farrington, 2006). The short-term objectives of SCM are primarily to increase productivity and reduce inventory and

cycle time, while long-term objectives are to increase market share and profits for all members of the supply chain (Ketchen and Hult, 2010). Financial metrics have served as a tool for comparing organizations and evaluating an organization’s behavior over time. Any organizational initiative, including supply chain management, should ultimately lead to enhanced organizational performance.

A number of prior studies have measured organizational performance using both financial and market criteria, including return on investment (ROI), market share, profit margin on sales, the growth of ROI, the growth of sales, the growth of market share, and overall competitive position (Lambert, 2012). In line with the above literature, the same items will be adopted to measure organizational performance in this study.

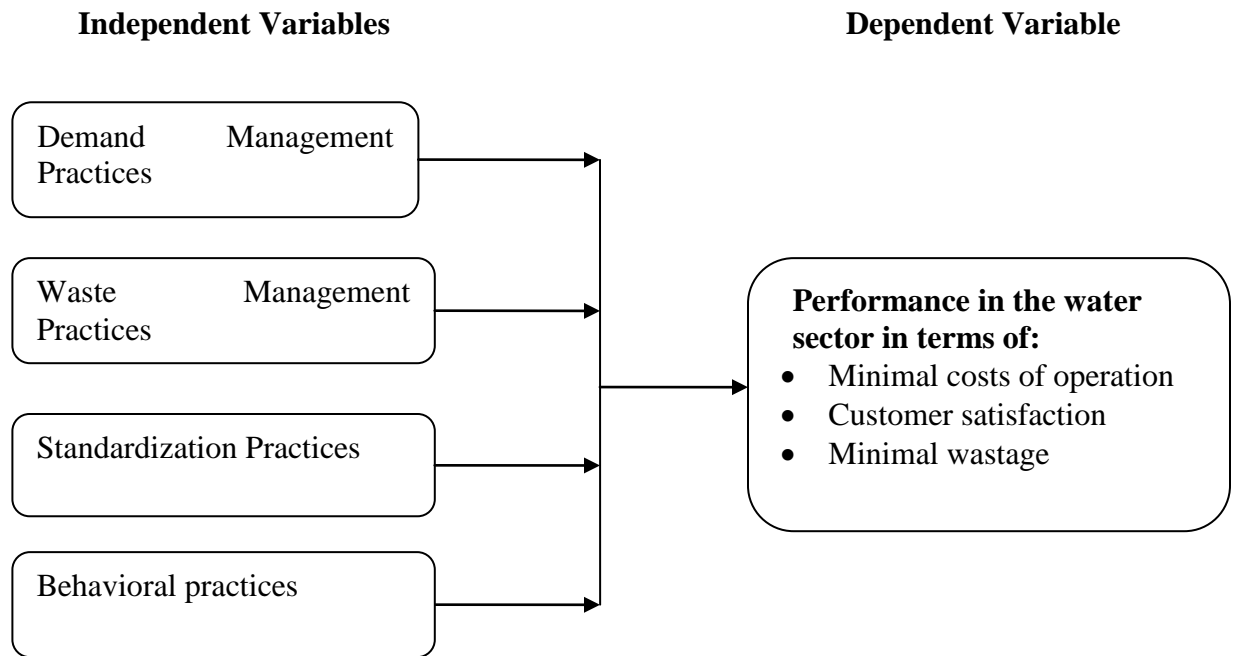
## 2.6 Summary of Empirical Studies

<b>Author</b>	<b>Study</b>	<b>Findings</b>	<b>Limitation/research gap</b>
Daud and Zailani, 2011	Lean supply chain practices and performance in the context of Malaysia	Lean supply chain practices are directly related to the performance of the electrical, electronics and electronics manufacturing service companies in Malaysia	The study was done in Malaysia and therefore we need to do a study in Kenya
Mageto 2009	Relationship between supply chain performance and supply chain responsiveness in supermarkets in Nairobi	Supply chain performance and supply responsiveness, reliability, flexibility and timeliness indicate very strong relationship with supply chain performance	The study was done in supermarkets and therefore we need to do a study in water sector
Karoki, 2014	Application of lean thinking to business	Lean management and application of related tools,	The study was done in Kenya Revenue

	process management	equipment and techniques is a continuous process at Kenya Revenue Authority highly driven by the need to improve service delivery and tax collection while netting those evading taxes	Authority and therefore we need to do a study in water sector
Wainaina, 2009	Supply chain management strategies and performance of commercial entities	Organizations in Kenya were yet to fully embrace the supply chain management strategies and most of the practices used were borrowed from the procurement philosophy.	The study was done in commercial banks and therefore we need to do a study in water sector
Awino, 2009	Supply chain management in large private manufacturing firms in Kenya	Various challenge which include; resistance to change by management and inadequate technology to support the concept was key hindrances of the practice.	The study was done in private manufacturing firms and therefore we need to do a study in water sector

## 2.7 Conceptual Framework

Figure 2. 1 Conceptual Framework



(Author, 2015)

Communicating demand involves communicating demand plan to the supply and finance organization and increasingly, to supply chain partners. Influencing demand includes marketing and selling tactics, product positioning, pricing, promotions and other marketing and sales efforts, while managing and prioritizing demand includes managing customer orders to match available supply (Shafer and Meredith, 2003). JIT means producing what is needed and no more, anything over the minimum amount necessary is viewed as waste, because effort and material expended for something not needed now cannot be utilized now. The goal is to drive all inventory queues to zero, thus minimizing inventory investment and shortening lead time (Aquilano et al., 2005). Quality control is the technique and activities that are used to fulfill requirements for quality and the main concern is defects detection and correction and relates to such activities as determining

where, how and at what intervals inspections should take place, the collection and analysis of data relating to defects and determining what corrective action should be taken (BS EN ISO 8402, 1995). Four inspection activities are receiving inspection, classification inspection, control inspection and audit inspection.

Organizational behavior is the study of the structure, functioning and performance of the organization, and the behavior of groups and individuals within them. Best in class behavioral practices include job enrichment, multiple career ladders, high employee participation, many and flexible incentives and quality of work life emphasis (Huczyski and Buchanan, 2002).

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This section outlined; research design target population, data collection methods and techniques and data analysis method.

### **3.2 Research Design**

This study adopted a descriptive survey research design aimed at establishing the effects of lean supply chain on organization performance in water companies in Kenya. A descriptive study is concerned with finding out the what, where and how of a phenomenon and a cross-sectional survey design is chosen since in cross-sectional surveys, data is collected at one point in time from sample selected to represent a larger population (Mugenda, 2003). The descriptive study aimed at obtaining information that could be analyzed, patterns extracted and comparison made for the purpose of clarification and provision of basis for making decisions. Both qualitative and quantitative data will be obtained for comparison purposes.

### **3.3 Population**

The target population for the study was the 117 Water Service Providers (WSPs) which were linked to 8 regional Water Services Boards (WSBs) in charge of asset management through Service Provision Agreements (SPAs). Due to the small number of the water service providers, a census was conducted to get the overall view in all the eight regions. The purpose of census was to gather information about the general population, in order to present a full and reliable picture of the study subject. This study used census in order to

get the overall view of lean supply chain management practices in the water sector in Kenya.

### **3.4 Data Collection**

Primary data was collected using structured questionnaires with both close-ended and open-ended questions. The Primary data was collected from respondents by the use of questionnaires as the main instruments of data collection. Questionnaires were sent through the email to majority of the respondents and the researcher made phone calls to encourage the respondents to fill in the questionnaire and email back. For the respondents who were around Nairobi and its environs, the researcher visited the respondents and administered the questionnaires to them.

### **3.4 Data Analysis**

The data collected was edited to identify and remove errors made by respondents. Edited data was then coded in order to translate responses into specific categories. Code numbers were assigned to each answer of survey question and from this a coding list or frame was obtained. Coding was expected to organize and reduce research data into manageable summaries.

Descriptive statistics such as means, percentages and frequency distributions were used to describe the responses as it was a better method of presenting the findings of the study. Presentation of the results was done on tables, pie charts and bar graphs. The study also employed inferential statistics to establish the relationship between lean supply chain management and organizational performance in the water sector in Kenya. Specifically, the study used Spearman correlation to establish this relationship.

The following regression equation was used;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where Y= Organizational performance

$X_1$ = Demand Management Practices

$X_2$  = Waste Management Practices

$X_3$  = Standardization Practices

$X_4$  = Behavioral practices

e = Error

$\beta_0$  = The constant which is the value of dependent variable when all the independent variables are 0.

$B_i$  = The regression coefficient or change induced by  $X_1$ ,  $X_2$ ,  $X_3$  and  $X_4$  on Y. It determines how much each ( $X_1$ ,  $X_2$ ,  $X_3$  and  $X_4$ ) contributes to Y (Organizational performance)

## **CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION**

### **4.1 Introduction**

This study was carried out to establish the lean supply chain management practices and organizational performance in the public water sector in Kenya. Data was collected from supply chain managers, procurement managers and operations managers who were in charge of supply chain functions in their respective companies. The findings are presented as follows;

### **4.2 Response Rate**

A total of 117 questionnaires were distributed to the respondents. Out of the 117 questionnaires, 109 were returned to the researcher. This represents a response rate of 93%. This percentage was considered sufficient for this study. The high response rate was achieved due to face to face administering of the questionnaires by the researcher and frequent phone calls requesting the respondents to respond and email back the questionnaires.

### **4.3 Demand management practices**

The study sought to determine the extent to which the water companies implemented the Demand management practices. . The responses were rated on a five point Likert scale where: 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent. The mean and standard deviations were generated from SPSS and are as illustrated in table below.

**Table 4.1 Demand management practices**

<b>Demand management practices</b>	<b>Mean</b>	<b>Std. Dev</b>
The firm has invested time and money in collaborative demand planning	4.4	1.29
The firm manages its customer orders to match available supply.	4.3	1.16
The firms always conducts annual demand forecasting	4.2	1.23
The firm always communicates its demand forecasts to its supply chain partners.	4.2	1.12
The firm always conducts annual production and purchasing planning	4.1	1.22
The firm always does product positioning, pricing and promotion of its products.	3.6	1.11

**Source: Research Data (2015)**

According to the study findings, it was established that the firm has invested time and money in collaborative demand planning was to a great extent (mean of 4.4), the firms always conducts annual demand forecasting was to a great extent (mean of 4.2), the firm always conducts annual production and purchasing planning was to a great extent (mean of 4.1), the firm always communicates its demand forecasts to its supply chain partners was to a great extent (mean of 4.2), the firm always does product positioning, pricing and promotion of its products was to a moderate extent (mean of 3.6) while the firm manages its customer orders to match available supply was to a very great extent (mean of 4.3). The study deduced that demand management is concerned with balancing the requirement of internal and external customers with supply chain capabilities according to Lysons and Farrington (2006).

#### 4.4 Waste management practices

The study also sought to determine the extent to which the water companies implemented the Waste management practices.. The responses were rated on a five point Likert scale where: 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent. The mean and standard deviations were generated from SPSS and are as illustrated in table below.

**Table 4.2 Waste management practices**

<b>Waste management practices</b>	<b>Mean</b>	<b>Std. Dev</b>
The firm has small specialized plants rather than vertically integrated manufacturing facilities.	4.6	1.19
The firm encourages doing the right thing the first time	4.3	1.12
The authority to produce or supply additional parts always comes from the downstream	4.3	1.14
The firm produces what is needed and no more (JIT)	4.2	1.24
The firm practices the philosophy of grouping similar parts in families to eliminate movement and queue	3.8	1.03
The firms production flow is smooth to dampen reaction waves that occur in response to schedule variations	3.6	1.17

**Source: Research Data (2015)**

The study sought to find out the extent to which firms have implemented waste management practices. According to the study findings, it was established that the firm has small specialized plants rather than vertically integrated manufacturing facilities was to a very great extent (mean of 4.6), that the firm practices the philosophy of grouping similar parts in families to eliminate movement and queue was to a moderate extent (mean of 3.8), that the firm encourages doing the right thing the first time was to a very

great extent (mean of 4.3), that the firm produces what is needed and no more (JIT) was to a great extent (mean of 4.2), that the firms production flow is smooth to dampen reaction waves that occur in response to schedule variations was to a moderate extent (mean of 3.6) while that the authority to produce or supply additional parts always comes from the downstream operations was to a very great extent (mean of 4.3).

The study deduced that waste management practices is anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production, and the seven types of waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects according to Aquilano et al., (1995).

#### **4.5 Standardization Practices**

The study also sought to determine the extent to which the water companies implemented the Standardization practices.. The responses were rated on a five point Likert scale where: 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent. The mean and standard deviations were generated from SPSS and are as illustrated in table below.

**Table 4.3 Standardization Practices**

<b>Standardization Practices</b>	<b>Mean</b>	<b>Std. Dev</b>
The firm always employs quality assurance at all times	4.6	1.13
The firm encourages quality control activities in all its production stages	3.9	1.14
The firm has standardized and rationalized the range of materials, parts and consumables	3.7	1.21

**Source: Research Data (2015)**

According to the study findings, it was established that the firm has standardized and rationalized the range of materials, parts and consumables was rated to a moderate extent (mean of 3.7), that the firms always employs quality assurance at all times was to a very great extent (mean of 4.6) while that the firm encourages quality control activities in all its production stages was to a moderate extent (mean of 3.9). The study deduced that standardization practices help clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and reduce cost of material handling (Lysons and Farrington, 2006). These practices include variety reduction, quality assurance and quality control.

#### **4.5.1 Quality assurance practices**

The study sought to identify the quality assurance activities that the firm practices as an approach to defect prevention. The findings are presented in the table below.

**Table 4.4 Quality assurance practices**

	<b>Frequency</b>	<b>Percentage</b>
Quality system (ISO 9000)	28	26
New design control	11	10
Incoming material control	21	19
Supplier appraisal	14	13
Design for manufacturing processes	17	16
All of the above	17	16
None of the above	0	0
<b>Total</b>	<b>109</b>	<b>100</b>

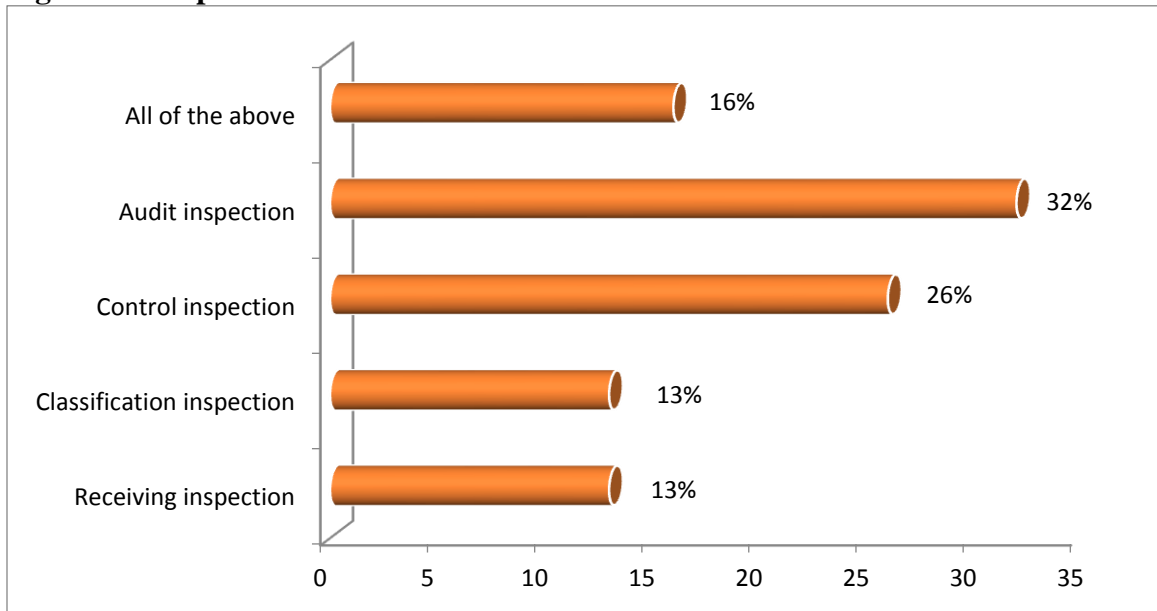
**Source: Research Data (2015)**

According to the study findings, majority of the respondents indicated that Quality system (ISO 9000) was the quality assurance practice identified as an approach to defect prevention accounting for 26%, incoming material control was the quality assurance practice identified as an approach to defect prevention accounting for 19%, design for manufacturing processes and all of the above quality assurance practice identified as an approach to defect prevention accounted for 16% respectively, supplier appraisal was the quality assurance practice identified as an approach to defect prevention accounted for 13% while new design control was the quality assurance practice identified as an approach to defect prevention accounted for 10%. The study deduced that the quality assurance practice used by the public water companies in Kenya was Quality system (ISO 9000).

#### **4.5.2 Inspection Activities**

The respondents were requested to identify the inspection activities that are undertaken in their firms to detect defects. The findings are presented in the figure below.

**Figure 4.1 Inspection Activities**



**Source: Research Data (2015)**

According to the study findings, majority of the water companies used audit inspection to detect defects as accounting for 32%, control inspection was identified an inspection activity undertaken to detect defects accounting for 26%, all of the above inspection activities was identified an inspection activity undertaken to detect defects accounting for 16% while receiving inspection and classification inspection were identified an inspection activity undertaken to detect defects accounting for 13% respectively. The study deduced that the inspection activity that was undertaken by water companies in Kenya was the audit inspection.

#### **4.6 Behavioral practices**

The study also sought to determine the extent to which the water companies implemented the Behavioral practices. The responses were rated on a five point Likert scale where: 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to

a very little extent. The mean and standard deviations were generated from SPSS and are as illustrated in table below.

**Table 4.5 Behavioural practices**

<b>Behavioral practices</b>	<b>Mean</b>	<b>Std. Dev</b>
The firm has always broadened the experience of work to enhance employee needs satisfaction	4.6	1.08
The firm always encourages high employee participation	4.6	1.21
The firm always encourages quality of working life emphasis	4.3	1.18
The firm has multiple carrier ladders for its staff	4.1	1.23
The firm has many and flexible employee incentives	3.4	1.03

**Source: Research Data (2015)**

According to the study findings, it established that the respondents rated the behavioral practices on the firm has always broadened the experience of work to enhance employee needs satisfaction to a very great extent (mean of 4.6). The behavioral practice on the firm has multiple carrier ladders for its staff was rated to a great extent (mean of 4.1). The behavioral practice on the firm has always encouraged high employee participation was rated to a very great extent (mean of 4.6).

The behavioral practice on the firm has many and flexible employee incentives was rated to a moderate extent (mean of 3.4) while the behavioral practice on the firm has always encourages quality of working life emphasis was rated to a great extent (mean of 4.3). The study deduced that the supply chain partners from upstream suppliers to downstream customers collaborate as a team to provide value to the end user. According to Huczyski and Buchanan, 2002 best in class behavioral practices include job enrichment, multiple carrier ladders, high employee participation, many and flexible incentives and quality of work life emphasis.

#### 4.7 Performance of the organization

The study also sought to determine the extent to which the respondents agreed with the following statement regarding the performance of their organizations. The responses were rated on a five point Likert scale where: 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent. The mean and standard deviations were generated from SPSS and are as illustrated in table below.

**Table 4.6 Performance of the organization**

<b>Performance</b>	<b>Mean</b>	<b>Std. Dev</b>
There is improved levels of professionalism	4.7	0.54
Services offered are good	4.6	0.48
Decision making is efficient	4.3	0.51
There has been an overall reduction in costs incurred	4.1	0.62
Customers' requirements are met in terms of quality	4.1	0.52
There is avoidance of product reject/return	3.7	0.48
There is real time delivery of goods and services	3.2	0.65

**Source: Research Data (2015)**

From the findings above, majority of the respondents agreed to a very great extent that there were improved levels of professionalism; services offered were good; decision making was efficient; there has been an overall reduction in costs incurred and customers' requirements were met in terms of quality as indicated by the mean scores of 4.7, 4.6, 4.3 and 4.1. on the other hand, most of the respondents agreed to great extent that there was avoidance of product reject/return and there were real time delivery of goods and services as shown by the mean scores of 3.7 and 3.2 respectively.

#### 4.7.1 Operational performance measure

**Table 4.7 Operational Performance measure**

	2012		2013		2014	
Year	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Quality improvement	3.6	0.16	4.4	0.48	4.6	0.16
Customer satisfaction	4.4	0.17	4.3	0.52	3.8	1.01
Efficiency levels	4.7	0.70	4.5	0.62	4.5	0.22
Productivity	3.4	0.62	4.6	0.54	3.4	1.49
Cost reduction	3.8	1.01	4.1	0.05	3.1	1.32

**Source: Research Data (2015)**

From the findings above, majority of the public water companies improved on their quality over the last three years as indicated by the mean scores of 3.6, 4.4 and 4.6 respectively. On the other hand, the companies recorded low customer satisfaction over the three years as shown by the mean scores of 4.4, 4.3 and 3.8 respectively. On efficiency levels, the study established that the levels were high at 4.7 in 2012 but remained constant in the next two years. On productivity, majority of the companies reported high productivity in 2013 and lowest in 2012 while productivity went up in 2014 as shown in the table above. On cost reduction, the study established that majority of the public water companies reduced their cost to a very high extent in 2013 with a mean score of 4.1 and lowest in 2014 with a mean of 3.1 while in 2012 the level of cost reduction was at a mean of 3.8.

#### **4.7.2 Challenges facing water sector in meeting customer requirement**

The study sought to find out the challenges that were facing water sector in meeting customer requirement. According to the study findings, the following were found to be challenges facing the water sector: Harmonization with other policies: Although the 1999 water policy is reasonably good, there will be need to update it in the near future to harmonize it with the sanitation policy, irrigation policy, and the environment policy, among others, which are at advanced stages of preparation.

Classification of water companies: Under the Companies Act, water companies are registered as private, limited liability companies but majority are owned by local authorities and are managing public assets to give an essential public service. Attracting private investment capital where the funds available from the Government and development partners are not enough to meet the MDGs with regard to WSS.

WSP change-over mechanism: It is generally held that if a WSP does not perform as expected, another one will be appointed in its place. The mechanisms for effecting the change are however unclear. They should be clearly stated in the law or WASREB rules.

Division of Assets: In some WSPs the ownership of assets is held by the LA and the WSB. Valuation is sometimes difficult as utilities experience continuous rehabilitation and expansion. Economic viability of schemes: Some WSPs are too small to be viable. Credible criteria to determine viable WSPs is required

#### **4.7.2 Mitigation of the Challenges**

The study sought to find out how water companies mitigated the challenges they face. According to the study findings, majority of the companies developed policies that

protected the company from government interference through training and seminars the adoption of technological innovation and intensive strategies to improve value for the customers.

#### **4.8 Relationship between Lean Supply Chain Management Practices and Organizational Performance**

Further the researcher conducted a multiple regression analysis so as to analyze the lean supply chain management practices and organizational performance in the public water sector in Kenya. The researcher applied the statistical package for social sciences (SPSS) to code, enter and compute the measurements of the multiple regressions for the study.

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Demand Management Practices, Waste Management Practices, standardization Practices and Behavioral practices).

The four independent variables that were studied, explain only 83.4% of Organizational performance as represented by the adjusted  $R^2$ . This therefore means that other factors not studied in this research contribute 16.6% of Organizational performance. Therefore, further research should be conducted to investigate the other factors (16.6%) of Organizational performance in the public water sector in Kenya.

**Table 4.8 Regression Coefficients**

<b>Model</b>	<b>Unstandardized Coefficients</b>		<b>Standardized Coefficients</b>		
	<b>B</b>	<b>Std. Error</b>	<b>Beta</b>	<b>t</b>	<b>Sig.</b>
(Constant)	1.308	1.342		1.623	0.357
<b>Demand Management Practices</b>	0.558	0.310	0.172	4.342	.0276
<b>Waste Management Practices</b>	0.731	0.156	0.210	3.592	.0285
<b>Standardization Practices</b>	0.785	0.322	0.097	3.542	.0202
<b>Behavioral practices</b>	0.620	0.285	0.148	3.458	.0249

**Source: Research Data (2015)**

Multiple regression analysis was conducted as to determine the relationship between Organizational performance and the four variables. As per the SPSS generated table 4.19, the equation

$(Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon)$  becomes:

$$Y = 1.308 + 0.558X_1 + 0.785X_2 + 0.620X_3 + 0.731X_4$$

The regression equation above has established that taking all factors into account (Demand Management Practices, Waste Management Practices, standardization Practices and Behavioral practices) constant at zero, Organizational performance in the public water sector in Kenya will be 1.308. The findings presented also shows that taking all other independent variables at zero, a unit increase in Demand Management Practices will lead to a 0.558 increase in Organizational performance; a unit increase in Waste Management Practices will lead to a 0.731 increase in Organizational performance; a unit increase in Standardization Practices will lead to a 0.785 increase in Organizational

performance and a unit increase in Behavioral practices will lead to a 0.620 increase in Organizational performance in the public water sector in Kenya. This infers that use of Demand Management Practices contributed most to Organizational performance in the public water sector in Kenya followed by Waste Management Practices then Standardization Practices while Behavioral practices contributed the little to Organizational performance in the public water sector in Kenya.

At 5% level of significance and 95% confidence level, Waste Management Practices had a significance level of 0.0285; Demand Management Practices had a significance level of 0.0276, Behavioral practices had a 0.0249 significance level while Standardization Practices had a 0.0202 significant level. This implies that Standardization Practices was the most significant factor influencing customer satisfaction.

**Table 4.9 Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.913	0.834	0.751	0.4538

**Source: Research Data (2015)**

#### 4.8.2 ANOVA

**Table 4.10 ANOVA (Analysis of Variance)**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.424	9	.208	3.23	.002 <sup>a</sup>
	Residual	5.375	20	.232		
	Total	6.799	29			

**Source: Research Data (2015)**

a. Predictors: (Constant), (Demand Management Practices, Waste Management Practices, standardization Practices and Behavioral practices)

b. Dependent Variable: Organizational performance in the public water sector in Kenya

Analysis of Variance (ANOVA) consists of calculations that provide information about levels of variability within a regression model and form a basis for tests of significance.

The "F" column provides a statistic for testing the hypothesis that all  $\beta \neq 0$  against the null hypothesis that  $\beta = 0$  (Weisberg, 2005). From the findings the significance value is .002 which is less than 0.05 thus the model is statistically significant in predicting how Demand Management Practices, Waste Management Practices, standardization Practices and Behavioral practices affect Organizational performance in the public water sector in Kenya. The F critical at 5% level of significance was 3.23. Since F calculated is greater than the F critical (value = 2.21), this shows that the overall model was significant.

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

This study was carried out to establish the lean supply chain management practices and organizational performance in the public water sector in Kenya. This chapter presents the summary of findings based on the objectives of this study, gives conclusions, recommendations based on the findings of the study and the suggestions on areas that need to be researched as far as this concept is concerned.

### **5.2 Summary of Findings**

The study established that demand management was concerned with balancing the requirement of internal and external customers with supply chain capabilities. Further, the study found out that the firm had invested time and money in collaborative demand planning, the firms always conducts annual demand forecasting, the firm always conducts annual production and purchasing planning and that the firm always communicates its demand forecasts to its supply chain partners.

On waste management practices, the study found out that waste management practices is anything other than the minimum amount of equipment, materials, parts and workers (working time) which are absolutely essential to production, and the seven types of waste to be eliminated in the supply chain are: waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects. The study also found out that the firm has small specialized plants rather than vertically integrated manufacturing facilities, the firm encourages doing the

right thing the first time, the firm produces what is needed and no more (JIT) and that the firms production flow is smooth to dampen reaction waves that occur in response to schedule variations.

The study also found out that standardization practices help clear specification, achieve reliability and reduce costs, accurate comparison of quotation, less depended on specialist suppliers, reduce error and conflict and reduce cost of material handling. Further, the firms always employs quality assurance at all times and that Quality system (ISO 9000) was the quality assurance practice identified as an approach to defect prevention in majority of the water companies while control inspection was identified an inspection activity undertaken to detect in the water companies.

The study found out that behavioral practices include job enrichment, multiple carrier ladders, high employee participation, many and flexible incentives and quality of work life emphasis. On the other hand, the study established that behavioral practices on the firm has always broadened the experience of work to enhance employee needs satisfaction and The behavioral practice on the firm has multiple carrier ladders for its staff. Lastly, the study found out that there were improved levels of professionalism; services offered were good; decision making was efficient; there has been an overall reduction in costs incurred and customers' requirements were met in terms of quality.

### **5.3 Conclusions**

The study concluded that the lean supply chain practices used by the public water companies in Kenya were demand management practices, waste management practices, standardization practices, behavioral practices, inspection activities and assurance activities. The study concluded that the companies have been embracing lean supply

chain management strategies despite the challenges experienced from the internal and external environment. Lean supply chain management strategies have assisted the water companies to enhance their performance. This is supported by the results from a regression analysis conducted that indicated that there is a strong relationship between lean supply chain practices and performance of public water companies in Kenya. To gain competitive edge, public water companies in Kenya have no choice other than implementation of the lean strategies for survival.

#### **5.4 Recommendations**

On demand management practices, the study recommends that the companies should invest in time and money in collaborative demand planning, the firms should communicate its demand forecasts to its supply chain partners. On waste management practices, the study recommends that the companies should practice the philosophy of grouping similar parts in families to eliminate movement and queue. The study recommended that the firm should have standardized and rationalized the range of materials, parts and consumables. On behavioral practices, the study recommended that the firm should always broaden the experience of work to enhance employee needs satisfaction. The study recommended that all firms' business activities should be technologically driven in order to have a competitive edge which is seen as path to better results given the quality of processes and procedures that are enhanced by environmental force.

#### **5.5 Limitations of the Study**

It was such an uphill task for the researcher to convince the respondents to participate in the study. Organizations are known to work under very strict confidentiality in order to secure any unauthorized access to information. Most of the respondents agreed to

participate on condition that the information would not be divulged to any other party other than for academic purposes only.

The findings of this study and application thereof are limited to water sector in Kenya. They could not be applicable directly to other organizations operating outside the Kenyan water sector. It was therefore important to note that they could only be used for comparative purposes and not any direct application in another country.

### **5.6 Recommendation for Further Studies**

The researcher recommends that a similar study should be embarked on different companies in Kenya to verify the study results. Finally the researcher recommends that future researchers should investigate on the influence of government policies on lean supply chain practices and organization performance.

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## APPENDICES

### APPENDIX 1: QUESTIONNAIRE

#### Part A: Organizational Profile

Name of company \_\_\_\_\_

How many years has your company been in operation?

Below 5 years      [   ]              5 to 10 years      [   ]

11 to 15 years      [   ]              16 to 20 years      [   ]

Above 20 years      [   ]

Size of company (No. of employees) \_\_\_\_\_

#### Part B: Relationship between lean supply chain practices and organization performance

##### Demand Management

To what extent has your firm implemented the following demand management practices (please tick appropriately using a scale of 1-5, where 5= to a very great extent, 4= great extent, 3- Moderate extent, 2= to a little extent and 1 = to a very little extent )

<b>Demand management practices</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
The firm has invested time and money in collaborative demand planning					
The firms always conducts annual demand forecasting					
The firm always conducts annual production and purchasing planning					

The firm always communicates its demand forecasts to its supply chain partners.					
The firm always does product positioning, pricing and promotion of its products.					
The firm manages its customer orders to match available supply.					

To what extent has your firm implemented the following waste management practices (please tick appropriately using a scale of 1-5, where 5= to a very great extent and 1 = to a very little extent)

<b>Waste Management Practices</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
The firm has small specialized plants rather than vertically integrated manufacturing facilities.					
The firm practices the philosophy of grouping similar parts in families to eliminate movement and queue					
The firm encourages doing the right thing the first time					
The firm produces what is needed and no more (JIT)					
The firms production flow is smooth to dampen reaction waves that occur in response to schedule variations					
The authority to produce or supply additional parts always comes from the downstream operations.					

To what extent has your firm implemented the following standardization practices (please tick appropriately using a scale of 1-5, where 5= to a very great extent and 1 = to a very little extent)

<b>Standardization Practices</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>

The firm has standardized and rationalized the range of materials, parts and consumables					
The firm always employs quality assurance at all times					
The firm encourages quality control activities in all its production stages					

Which of the following quality assurance activities does your firm practice as an approach to defects prevention?

- Quality system (ISO 9000)                New design control
- Incoming material control                Supplier appraisal
- Design for manufacturing processes     All of the above
- None of the above

Which of the following inspection activities does your firm undertake to detect defects

- Receiving inspection                        Classification inspection
- Control inspection                        Audit inspection
- All of the above                        None of the above

To what extent has your firm implemented the following behavioral practices (please tick appropriately using a scale of 1-5, where 5= to a very great extent and 1 = to a very little extent)

<b>Behavioral Practices</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
The firm has always broadened the experience of work to enhance employee needs satisfaction					
The firm has multiple career ladders for its staff					

The firm always encourages high employee participation					
The firm has many and flexible employee incentives					
The firm always encourages quality of working life emphasis					

To what extent do you agree with the following statements regarding the performance of your organization? (please tick appropriately using a scale of 1-5, where 5= to a very great extent and 1 = to a very little extent)

<b>Performance</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
Services offered are good					
Decision making is efficient					
There has been an overall reduction in costs incurred					
There is improved levels of professionalism					
There is real time delivery of goods and services					
There is avoidance of product reject/return					
Customers' requirements are met in terms of quality					

Kindly indicate the statistic of the following operational performance measure in the table below

<b>Performance measures</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>

Quality improvement			
Customer satisfaction			
Efficiency levels			
Productivity			
Cost reduction			

What are some of the challenges facing water sector in meeting customer requirement

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How are these challenges mitigated?

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**Thank you very much for your time and cooperation.**

**APPENDIX 1I: ROLES AND RESPONSIBILITIES OF  
INSTITUTIONS IN THE WATER SECTOR**

<b>Body</b>	<b>Responsibilities</b>
Ministry of Water and Irrigation	Policy formulation, sector coordination, monitoring, financing and supervision.
Water Resources Management Authority	Regulation of water resources management
Catchment Areas Advisory Committees	Advise the Water Resources Management Authority on issues concerning management of water resources at the catchment level
Water Services Boards	Responsible for the efficient and economical provision of water services within their area of jurisdiction through signing of service provision agreements with Water Service Providers
Water Resources Users Associations	Provides a forum for conflict resolution and cooperative management of water resources in designated catchment areas.
Water Service Providers	Direct provision of water and sewerage services as agents of Water Services Boards.
Water Appeal Board	Handle disputes in the water sector.
Water Services Trust Support	Financing of pro-poor water services in unserved areas.
National Water Conservation and Pipeline Corporation	Bulk water supply, dam construction, flood control, land drainage, ground water development and Ministry of Water and Irrigation reserve Water Service Provider
Kenya Water Institute	Training and research

Source: adapted from MWI (2005) quoted in Owuor & Foeken (2009)

## APPENDIX 11: LIST OF WATER SERVICE PROVIDERS

1. Lake Victoria South Water Services Board-
2. South Nyanza Water & Sewerage Company
3. Mikutra Water & Sewerage Company
4. Gusii Water & Sewerage Company
5. Tililbei Water & Sewerage Company
6. Lake Victoria North Water Services Board
7. Nzoia Water & Sewerage Company
8. AMATSI Water Company
9. Athi Water Services Board
10. Kiambu Water & Sewerage Company Ltd
11. Kikuyu Water Company Ltd
12. Nairobi Water & Sewerage Company Ltd
13. Karuri Water & Sanitation Company Ltd
14. Coast Water Services Board
15. Kilifi-Mariakani Water & Sewerage Company Ltd
16. Tana Water and Sanitation Company Limited
17. Kwale Water and sanitation company
18. Rift Valley Water Services Board
19. Eldama Ravine Water & Sanitation
20. Iten Water & Sewerage Company
21. Kapenguria Water Company
22. Tana Water Services Board
23. Nyeri Water & Sewerage Company
24. Muranga South Water & Sewerage Company
25. Kirinyaga Water & Sewerage Company
26. Nithi Water & Sewerage Company
27. Naromoru Water Company
28. Imetha Water Company
29. Tanathi Water Services Board
30. Kiambere- Mwingi Water and Sanitation Company
31. Yatta Water & Sewerage Company
32. Kibwezi-Makindu Water & Sewerage Company
33. Mwala Water & Sanitation Company
34. Wote Water & Sewerage Company
35. Matungulu Kangundo Water & Sewerage Company
36. Northern Water Services Board
37. Isiolo Water & Sewerage Company
38. Isiolo Water & Sewerage Company
39. Maralal Water & Sanitation Company
40. Mandera Water & Sewerage Company
41. Nakuru water and sanitation company
42. Lake Victoria North Water Services Board
43. Athi Water Services Board
44. Rift Valley Water Services Board
45. Tana Water Services Board
46. Tanathi water services board
47. Lake Victoria South Water Services Board
48. Coast Water Services Board
49. Nairobi City Water and Sewerage Company
50. Kisumu Water and Sewerage Company
51. Kapenguria water and sanitation company
52. Iten tambach water and sanitation company

53. Matamaiyo water service providers
54. Njabiini Ngwataniro water service providers
55. Turaga murauki water service providers
56. Laigiri water service providers
57. Nakuru urban water supply
58. Greater nakuru east water supply
59. Greater nakuru west water supply
60. Greater stream rural water supply
61. West acre water supply
62. Kerma rural water supply
63. Bahati chania water supply
64. Naivasha urban water supply
65. Suswa rural water supply
66. Eldama ravine urban water supply
67. Lodwar urban water supply
68. Narok urban water supply
69. Makutano urban water supply
70. Kapengurai urban water supply
71. Chepereria rural water supply
72. Orkum rural water supply
73. Kura rural water supply
74. Sigor rural water supply
75. Kiringet – tarta rural water supply
76. Iten teruach rural water supply
77. Tabarch urban water supply
78. Enmo water rural water supply
79. Endao water rural water supply
80. Matamaiyo water rural water supply
81. Njambini ngwataniro water rural water supply
82. Turaga maruaki water rural water supply
83. Laigiri water rural water supply
84. Laigiri water rural water supply
85. Turaga water rural water supply
86. Mawingo water society
87. Upper chania water service providers society
88. Engineer town water project
89. Ndaragwa water project
90. Oljororok kungui rural water supply
91. Kinangop ring main rural water supply
92. Kirima rural water supply
93. Gatimu rural water supply
94. Olkarau rural water supply
95. Kabarant urban water supply
96. Mugotio rural water supply
97. Marigat rural water supply
98. Chemolingot rural water supply
99. Timboroa rural water supply
100. Cheberan rural water supply
101. Kabarenjo rural water supply
102. Kepkong rural water supply
103. Tenges rural water supply
104. Seretamin rural water supply
105. Pemwai rural water supply
106. Rukawanin rural water supply
107. Kipkaech rural water supply
108. Ngetmio rural water supply
109. Kaptarakwa rural water supply
110. Chepkorio rural water supply
111. Kapkoi rural water supply
112. Lemek rural water supply
113. Mulot rural water supply
114. Alkurio rural water supply

115. Miriji-roria rural water  
supply

117. Solai menengai rural water  
supply

116. Lanet rural water supply