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Thesis Title: **Insufficient Potable Water Reticulations to Urban Households: The Case of Public Water Management in Abuja City, Nigeria.**

Name: **Donna Osasumwen Aimiuwu**

Supervisor: **Dr. Peter H.T. Scholten**

Specialization: **Urban Environment and Climate Change (UECC)**

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Insufficient Potable Water Reticulations to Urban Households: The Case of Public Water Management in Abuja City, Nigeria.

Donna Osasumwen Aimiuwu

Nigeria

Supervisor: **Dr. Peter H.T. Scholten**

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Summary

This study is about the prevailing situation of the municipal water supply in Abuja, the federal capital city (FCC) of Nigeria in West-Africa. The nation's water sector has had a number of policy formulations to improve service delivery of water to all the citizens on a sustainable basis. However, none of these efforts has brought about the needed panacea for sustainable water delivery.

The installation of the major water infrastructures and reticulation services was a 3-phased development that took place in the city from 1979 to 1980, beyond that period further expansion have been very skeletal such that only about 40% or less is the spatial spread of reticulations for the teeming population in the city. Water being very vital to all living forms and particularly to man as a means of sustenance requires better management strategies by the public sector to ensure that there is sufficient and sustainable supply to all households in the city of Abuja.

Consequently, the objective of this research is to explain how the management of Federal Capital Territory Water Board (FCT WB), the government agency in charge of potable water supply, influences the development of the reticulations to urban households in Abuja. The objective gave rise to the research questions that are directed at the strategies used by the management of the FCT WB to influence the causality at the beneficiaries end, which are the households in the city. The need to provide valid answers for this study led to the adoption of the 'multi-level governance framework' by Frantzeskaki and Tilie (2014).

The research strategy found suitable for such an explanatory voyage is the case study because of the empirical inference of the case in view. The case study supports experiential observations as evidence for checking the applicability of concepts in substantiating the reason for the empirical context (Blatter and Blume, 2008). The instrument used was semi-structured interview guides because some information is known of the situation but in-depth knowledge was required to provide the answers to the research questions.

A total of 20 in-depth interviews were conducted as follows: - 15 professionals from 3 actor groups namely FCT WB, Federal Capital Development Authority Engineering Services Department (FCDA ESD) and Federal Housing Authority (FHA) as well as on 5 residents in Kado estate of Gwarinpa district, a catchment area that is one of the oldest residential estates in the city and benefits sufficiently from the public water supply. Gwarinpa district was benchmarked against Lugbe district, the latter conspicuously lacks water reticulation yet it is one of the residential estates developed by the FHA (a co-actor in the water reticulation process). There was an overview of information, though not in-depth, from a 21st respondent in the FCDA ESD. The in-depth interviews were analysed by ATLAS.ti software being a qualitative research methodology and suitable for this study.

The main findings from the data analysis revealed that FCT WB is practically not in charge of the infrastructural development for water reticulations but the responsible agency is the FCDA ESD. The main policy goal of the FCT WB is to operate and manage the infrastructure and water reticulations after FCDA ESD has completed the installations of the primary and secondary reticulations. The only aspect of installations conceded to the FCT WB is tertiary reticulation of individual houses to the secondary lines that have been installed by the FCDA ESD. The situation begs for better coordination in Abuja water management.

Keywords

FCT Water Board, water management, potable water reticulations, multi-level governance, Abuja city residents

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Abbreviations

AfDB	African Development Bank
AMAC	Abuja Municipal Area Council
AMCOW	African Ministers' Council on Water
CAP	Chapter
FCC	Federal Capital City
FCDA	Federal Capital Development Authority
FCDA ESD	Federal Capital Development Authority, Engineering Services Department
FCT	Federal Capital Territory
FCTA	Federal Capital Territory Administration
FCT WB	Federal Capital Territory Water Board
FHA	Federal Housing Authority
FMWR	Federal Ministry of Water Resources
JICA	Japan International Cooperation Agency
L/c/d	Litres/capita/day
LFN	Laws of the Federation of Nigeria
LUD	Lower Usuma Dam
MA	Millennium Ecosystem Assessment
MDG	Millennium Development Goal
MLD	Million Litres per day
NGOs	Non-Governmental Organisations
PWI	Presidential Water Initiatives
RBDAs	River Basin Development Authorities
SWAs	State Water Agencies
TEEB	The Economic of Ecosystems and Biodiversity
TSA	Treasury Single Account
UNDP	United Nations Development Programme
UPVC	Universal polyvinyl chloride
USD	United States Dollar
WB	World Bank
WES	Water and Environmental Sanitation
WSMP	Water Supply Master Plan
WSS	Water Supply and Sanitation

Table of Contents

List of Tables

List of Pictures

List of Figures

Chapter 1: Introduction

1.1 Background

Water is very vital to the existence of all life forms, second only to air (i.e. oxygen for humans and animals but carbon-dioxide for plants) and is a resource of nature. Remarkably, the earth though surrounded by water (as per seas and oceans) has only 3% as fresh water while 97% is salty. Considering the scenario that only about one-third of the 3% global supply of fresh water is consumable and only one-thirtieth of this source is accessible paints a gloomy picture for the world's growing population. Correspondingly, water resource issues cannot be addressed outside the concept of ecosystem services – which are the life-supporting functions of ecosystems (or nature) for the well-being of humans (Daily et al., 2009; Jansson, 2013). A core aspect of this concept is the maintenance of ecosystems so that the well-being of humans, the active driver of (natural) resource management and preservation, is sustained (Menzel & Teng, 2010).

The benefits of ecosystem services to humans are of four categories namely supporting, provisioning, cultural, and regulating (TEEB 2011). Water in nature happens to be a function of both the provisioning and regulating roles of ecosystem services (Daily, 1997; Daily et al., 2009; Gomez & Barton, 2013), which determines the sources, distribution and purification for diverse uses in urban systems (Gomez & Barton, 2013; Ferguson et al., 2013). Human use of freshwater, particularly within urban systems, with population growth is intensifying and eliciting uncertainties as well as diminutions in the web of ecosystems such that the effects in one area eventually impacts on the entire systems (MA 2005; McGranahan et al., 2005; Dewulf et al., 2005; Hauck et al., 2013; Ezeabasili et al., 2014); causing global water stresses with corresponding social, economic and environmental implications such as water-borne diseases like cholera, poor food yields, and drought , the latter even in developed nations like the State of California (Edelenbos et al., 2013). There is therefore a need to safeguard and conserve freshwater resources as well as to provide sustainable supply and reticulation to the teeming population in urban systems with emergent governance strategies for better urban water management.

The focus of this thesis is on potable water reticulation to urban dwellers in an African city and how it is managed by the responsible government agency. Potable water reticulation in essence means the distribution of safe water supply to the houses in the city. The selected study area is Abuja, the Federal Capital Territory (FCT) of Nigeria. The FCT is geographically in the centre of Nigeria on 7,753.9 sq. Km land area and landlocked. The population size of Abuja was 1,406,239 as at 2006 census with a growth rate of about 2% per annum and the current demography by FCTA Study Report 2016 is estimated to be about 2,544,831. The water supply system for the city is projected for between 3million and 3.2million people (Ali, 2012; FCTA 2016). The city is characterized by two seasons - dry from November to March with temperature getting to 12°C and rainy from April to October with temperatures rising to 40°C while rainfall ranges between 305mm to 762mm (Abubakar, 2014). Abuja is within Abuja Municipal Area Council (AMAC), one of the six local authorities of the FCT. Abuja is not only the nation's capital city but the seat of the national government thus benefiting directly from the federal development plans and programmes as well as from its municipal authority.

AMAC is made up of 13 districts that were grouped into five phases for the purpose of development to gradually absolve the growing and in-migrating population into the city. The development includes service delivery of potable water supply by the FCT Water Board (among other social services like road networks, light, solid waste collection, etc. by other

agencies) to each of these districts from Phase 1 to Phase 4. The development of Abuja started in 1979 and prior to this development the first organized residential area was in Gwarinpa District, currently Phase 3 and the location for the official residence of the Administrator of Abuja, the Minister of FCTA**.** Further development plans led to creating Phase 5 within Phase 4, a suburban area known as Lugbe District, which is now part of the cityscape to provide more housing facilities for the unprecedented growing and in-migrating population. Phases 1, 2, and 3 districts are majorly urban and the main metropolis of Abuja (Abubakar, 2014; JICA 2014), while Phase 4 and especially Phase 5 are suburban. A capital city should be a prototype for sustainable urban water management and optimal service delivery; however this is not the case in Abuja hence the basis for this research with the aim to explain to what extent the management of FCT Water Board (WB) influence the observed insufficiency in potable water reticulation to households in the city.

1.2 Problem Statement

In Nigeria water has over time been taken for granted compared to other natural resources like crude oil yet it is the basic principle for economic development, environmental protection and socio-political enhancement (Ajai, 2012). Water resources management in the country is a responsibility shared by the three tiers of government as follows: - the federal (as Federal Ministry of Water Resources [FMWR] with 11 River Basin Development Authorities [RBDAs] for national water supply and sanitation [WSS] services) that formulates and facilitates national water policies; develops and manages large water resources facilities like river basins, reservoirs, dams, reservoirs, water supply and irrigation schemes; national funding; research development; and technical support); state (as State Water Agencies (SWAs) including FCT WB) that establish, operate, put in place quality control and maintain urban and suburban supply systems (at times in rural areas); license and monitor private water suppliers; and the local governments that provide for rural WSS service ensuring benefiting communities participation; establish, fund and equip water and environmental sanitation (WES) units in the councils (Goldface-Irokalibe, 2009; Ali, 2012; Ezeabasili et al., 2014).

The mode of management in this sector though hierarchical is highly uncoordinated because the three tiers of government pursue water goals on the abstraction, pollution control and watershed management separately (Goldface-Irokalibe, 2009). Moreover, the Water Resources Act CAP W2 LFN 2004 vests the right on the federal government to supervise the management and usage of all surface and groundwater resources to ensure environmental sanitation and protection, water security, biodiversity protection, flood control amongst others (Goldface-Irokalibe, 2009; Ajai, 2012). Thus, the FMWR should compulsorily have a master plan on the protection, development, administration, management and utilization of the nation's freshwater resources; reviewing the plan regularly to be quick to address emerging issues (Ajai, 2012). The source of potable water supply in Abuja is from the 'Gurara-Usuma dam' to the 'lower Usuma basin' with reservoir capacity of 100 million cubic metres (MCM) (Ali, 2012). However, the water demand of FCT Abuja is estimated to increase from 130 million litres per day (MLD) in 2010 to 496MLD in 2020 and by 2030 1,182MLD (JICA 2014). The above statistics confirm the "underlying principle for the emphasis on water resources management because it has come to be acknowledged as a 'good' that will be increasingly pressured over time with impacts on social equity, economic efficiency and environmental sustainability" (Gbadegesin & Olorunfemi, 2009). There are various aspects of urban water management from the freshwater source through harnessing and treatment to the distribution, however this thesis will focus on the reticulation by the mandated municipal agency to the households in the city for want of time and logistics.

The nation's water sector has had a number of policy formulations that include the National Rural Water Supply and Sanitation Policy of 2000, National Water Resources Management Policy of 2003, National Water and Sanitation Policy of 2004, National Water Resources Strategy of 2006, National Development Plan of 2007 and the Federal Ministry of Water Resources Roadmap (2011) to improve the service delivery at state levels (AMCOW 2011; Akpabio, 2012; Ajai, 2012; JICA 2014). Also, in 2003 there was the Presidential Water Initiatives (PWI) that targeted that by 2007 there shall be 100% accessibility to WSS services by the population in state capitals, 75% in other urban and suburban places, and 66% within rural communities (AMCOW 2011). Another target was the extension of sufficient potable water in a sustainable and affordable process to 100% of the population through participatory investment of government and the private sector as well as beneficiaries by year 2011 (Gbadegesin & Olorunfemi, 2009). Also, the 7th Millennium Development Goal was a programme that targeted providing sustainable access by 2015 to 50% of the populace lacking WSS amenities (Nigeria 2013 Report) though ended. None of these goals brought the needed panacea hence the prevailing situation in Abuja of only about 40% installed infrastructure for water supplies (FCTA 2016). Phases 1, 2 and parts of 3 including Gwarinpa District are serviced by the Water Board while Phases 4 and 5 are yet to be covered with this service. Invariably, the residents in the latter two totally depend on private interventions such as private boreholes for the middle and upper class while lower income earners either have wells and/or patronize local water vendors.

The above summation indicates that the installation of potable water infrastructure and services was gradually attained up to parts of Phase 3 since 1982 but it is yet to be extended to the latter two phases of the city's development, an indication of poor policy implementation by the responsible agencies. Also, parts of Phase 3 lacking this amenity were not mapped for habitation at the time the Master Plan was developed but are now developing as extensions to the city to absolve the rapid urbanization (FCTA 2016). Further, freshwater sources are known to be threatened by the prevailing climate change through reduced precipitation and by pollution through anthropogenic activities with corresponding impacts on urban systems and human well-being. These facts require better management strategies by the public sector to ensure the resource is protected and there is sufficient as well as sustainable supply to all households in the city.

1.3 Research Objective

The objective of this research is to explain the insufficiency in the development of potable water reticulations in Abuja (the Federal Capital City of Nigeria) from the management approach of the FCT Water Board.

1.4 Provisional Research Questions

1.4.1 Main Question

In what way does the management approach of FCT Water Board influence the development of potable water reticulation to the households in Abuja City?

1.4.2 Sub-questions

a. What approach is being used by the FCT WB management in the reticulation of potable water supply across the city?
b. To what extent has this approach led to sufficient reticulation of the service?
c. What strategies can improve the existing approach for sufficient reticulation of water supply to all households in the city?

1.5 Significance of the Study

In the public sector service delivery includes provision of adequate supply of potable water in good quality and sufficient quantity to the city dwellers on a sustainable development, which is essential for a healthy society. The management of potable water supplies to the urban households requires strategies that encourage networks among relevant actors, whether in the public sector, private organisations, non-governmental organisations and even civil organisations for sustainable development of the service.

This study highlights the relational characteristic that co-actors should adopt in service delivery, which includes this case on potable water reticulations. A major barrier to achieving sufficiency in several sectors of most developing economies is paucity of funds, notwithstanding a more articulate management of the water sector by the FCT WB should lead to achieving set goals on a gradual basis. The study is significant to identify within a case scenario the causality for the shortfall in providing sufficient potable water reticulations to the urban residents, even though there is a documented 'Water Supply Master Plan' for Abuja city.

Again, this study is contributing to academic knowledge by relating an empirical situation in Abuja though for water with a study done in Rotterdam on urban ecosystem services, with surplus data that confirm other possible reasons for the insufficient reticulations prevailing in Abuja. The study highlights the principle of "multi-level governance approach" (Frantzeskaki and Tilie, 2014) and how the tools of the approach can enhance service provision and delivery even in developing economies.

1.6 Scope of the Study

The scope of this study research is centred on the function of the core water service provider for Abuja and the management approach in providing potable water supply to the residents in the city. The essence is to present the prevailing status of the potable water reticulations in Abuja, focusing on the development within Gwarinpa District of the city and the management causal factors that has contributed to the situation of insufficient reticulations.

1.7 Limitations of the Study

An obvious limitation of this study is that the findings are specific to Abuja, being a case study, and cannot be generalized to other cities even in Nigeria. Another limitation was 'time' in reaching key informants in respective agencies identified as co-actors in the water provision scheme of the city. The fieldwork was during the fasting period for Muslims and almost a week's public holiday was declared for their Sallah celebration that jettisoned any appointment for that week.

However, it was enough time to conduct the interviews on a sample of key informants from three respective government agencies and on some residents in a recognized catchment area in Abuja. There was an overview from the FCDA ESD of all that the previous informants from that agency had variedly stated in the in-depth interviews which was not captured in the analysis by ATLAS.ti.

Chapter 2: Literature Review

2.1 Introduction

This chapter essentially reviews articles published by authors and scholars in similar and relevant study areas with the intent to provide answers to the research questions in this study. In nature potable water occurs as "freshwater", a resource from the provisioning and regulating roles of ecosystem services (Gomez and Barton, 2013). The vital contributions of ecosystems to urban systems include the regulation, storage and supply of freshwater for sundry human usage (Gomez and Barton, 2013; Ferguson et al., 2013). The effects of the changing global climate and local anthropogenic activities with the demand for adequate management of water resources to sufficiently meet urban dwellers in good quality and on sustainable basis are a reality that begs for appropriate responsiveness.

The key words in this literature review are: - FCT Water Board, water management, potable water reticulation, multi-level governance and Abuja city residents. These words amongst others are relevant to the research with the objective to explain in what way the municipal government agency that manages the potable water supply influences the reticulation to the urban households in Abuja, Nigeria.

2.2 Freshwater, the Natural and Potable Resource

Freshwater comprises precipitation recognized globally as rainfall or snowfall that permeates the ground and get into underground aquifers, drains into river channels as runoffs, evaporates from surface water sources and from flora, eventually flowing back into estuaries and deltas along the margins of continents (Wescoat Jr., 2015). The world's freshwater supply is only about 3% of natural water resources with the greater are the oceans (97%), the latter being saltwater. This freshwater sources occur simultaneously as "68.7% frozen glaciers and icebergs, 30.1% groundwater, 0.26% lakes, 0.04% the atmosphere, 0.03% marshes, 0.0006% rivers, and 0.0003% biological water according to Shiklomanov (1993) and Trenberth et al. (2007)" cited by Wescoat Jr. (2015). Freshwater in its simplified term "water" has come to mean "life" for its ability to sustain all living beings whether plants or animals (including humans) as well as micro, meso or macroorganisms in whatever medium of existence. The average human body weight is reckoned to be about 70% water such that humans can exist without water for only few days or expire from dehydration and similar complications. Further, the importance of water as a natural and needed resource to humans is founded in a three dimensional context according to Linton (2010). The three dimensions are: -

a) *Ecological* – sustaining healthy terrestrial and aquatic ecosystems;
b) *Cultural* – water articulates in a myriad of ways with people of all races and cultures to define varied meanings and relationships for well-being and livelihood; and
c) *Political* – distributing the socio-economic benefits sustainably through specific modes of water governance.

2.3 Urbanization and the Demand on Water Resources

Water resources ***are*** needed for all human activities that include domestic, recreational, agricultural, environmental, developmental and industrial to the extent that the demand is abnormally exceeding the supply in many parts of the world due to rapid urbanization

(Vairavamoorthy et al., 2008). Urbanization has become one of the most signification trends in prevailing times that impacts enormously on human well-being, natural resource use, energy utilization and economic development (McDonald et al., 2011; 2014). The demand for water has increased dramatically due to the search for increase in wealth, food and energy generation (Salami et al., 2013). The projections on urban growth and its rapidity is that by 2030 cities across the world will have a combination of 1.5 billion people, more in developing nations like Abuja, with the need to make water available, accessible, affordable and in good quality to them (McDonald et al., 2011; Abubakar, 2014). The predicted increases in population in cities imply that the responsible actors should strive to maintain per capita water services regardless of any constraint in availability. This means that urban dwellers should rely on publicly provided water services (Barbier & Chaudhry, 2014). The urban dwellers aptly describes all within the cityscape on a permanent basis as residents, regardless of if they are renting or have their own houses or the nature of livelihood. In view of such overt demand for freshwater resources in urban systems, the supply, reticulation and replenishment of its sources is yet to be sufficiently studied to determine the efforts needed to assuage any major crisis in the future.

Consequently, the interaction of population growth, urbanization, economic activities and climate change can impact and cause scarcity of freshwater resources for ecosystems, urban systems and dwellers (Edelenbos et al., 2013).

2.4 Potable Water Service Management

The management of water, especially for consumption and diverse usage, in urban systems is majorly the responsibility of government (Edelenbos and Teisman, 2013) and service delivery of potable water is usually termed public or municipal water supply. The public water service management in Nigeria is basically hierarchical and a top-down approach. It is a process facilitated by the national government through the FMWR while other authorities affiliated with the water sector exist that should be carried along in the process. They include Federal Ministries of Environment; Health; Science & Technology; Education; Youth Development & Special Duties; Women Affairs and Inter-Governmental Affairs – a regime practically duplicated at the States domain (level) in policies, legislation, development, regulation, management, and monitoring responsibilities (Akpabio, 2012). The Federal Capital Territory Administration (FCTA) is the municipal authority governing the state affairs of Abuja and the FCT Water Board is the agency under the FCTA with the responsibility for public water service in Abuja. The FCT WB is at par with respective SWAs.

Water management is considered as an interconnected and complex system because it touches on several domains and fields that include agriculture, economic development, social development, ecology and health (Edelenbos et al., 2013). Water resources accessibility is a statutory and global human right (Akpabio, 2012), thus managing and providing sufficient potable water service to all households in Abuja should be the core function of the FCT WB.

There are three main issues in the provision of freshwater supplies by urban managers according to McDonald et al. (2011), which are: -

a) Water availability – in a region, the total quantity of surface or groundwater that is sustainably apportioned for urban use;
b) Water delivery - the challenge of reticulating available water to households from the source like dams, canals, wells to treatment facility and through pipes

c) Water quality - the suitability of the supplied resource for diverse purpose by households

The rationale for establishing the FCT WB amongst other factors is for the protection of the public water sources; provide extensive urban and rural WSS reticulations; conform to wider global initiatives and goals; ensure safe water delivery to the populace and control activities within the sector (Akpabio, 2012). An effectual public water service management is essential with priorities premised on sustainable urban systems and healthy watersheds but to effectively attain these priorities is a continuing inquiry (Kim et al., 2015).

2.4.1 Social Aspects of Water Management

Water resources management is a keen issue socially even though many developing nations including Nigeria tend to overlook or exclude the social aspects of public water service management (Salami et al., 2013). The reticulation of water supplies to urban residents is usually inequitable depending on how developed an area is and the attributes of socio-economic effects like affordability as well as the demands by influential personalities, government and bureaucrats. However, there can be high cost of accessing the public supplies, irregular supplies and selective reticulation to prominent people in the society which gives rise to patronizing private water operators or drilling private boreholes by the affluent (Akpabio, 2012).

According to Linton (2010), human population is a kind of abstraction that juxtaposes global water supplies leading to the inevitable crisis of water scarcity. Invariably, Linton theorized that water has a fixed supply while human population is increasing so the outcome of this parallel is not "water crisis" but "crisis of (modern) water" meaning that the social aspects is the basis for such crisis. Thus, "water stress" is identified in countries with less than 1,700m^3 water supplies per person per annum: a phenomenon that is currently affecting about 30% of people in the world (Edelenbos et al., 2013) and is predicted to get worse with increasing urbanization amongst other factors.

There is a dominant policy ideology that supports integration of actors across levels, scales and domains for mutual respect and trust in the process of development (Bressers and Kuks, 2013), which should halt societal fragmentation that occurs when different water management interests do not communicate government decisions and so cause disconnections to households **(**Lubell and Edelenbos, 2013). Public water service management is a kind of urban governance that should relate to the sphere of the informal and unconventional measures that are increasingly being created by individuals as a retort to failures in service delivery by the government (Moretto, 2015).

All individuals regardless of class or status desire water for diverse needs and so beneficiaries should have connective roles in the management process because this collaboration is important for adaptation and for the interaction between emerging governance arrangements and established institutions of development (Edelenbos et al., 2013). There is so much focus on government and government's action that it tends to underestimate the corresponding relevance that non-government domains, like the society, have on public water service management (Edelenbos and Teisman, 2013), which can be adduced as a probable cause for the municipal water supply not reaching every household yet in Abuja.

2.4.2 Economic Aspects of Water Management

Water simply serves the diverse needs of humans especially for consumption and refreshment but this service is more diverse and challenging when it comes to economic development and

cities in developing countries, especially, are facing challenges of poor water quality due to pollution from economic activities such as industrial discharges (Edelenbos et al., 2013).

The economics of water has been assessed to reveal that one US dollar investment can garner benefits valued at two US dollar through better access to water services, which makes about 70% contribution to water benefits (Kayser et al., 2013). Although in Nigeria there have been rapid growth in commercial activities and of demography over the years the level of public investments in the water and sanitation sector is not commensurate. This observation was clearly portrayed by the failure to meet the 7th Millennium Development Goal (MDG) as the general expenditure by the three levels of government in this sector fell far short by USD60.64 (2006), USD37.34 (2007) and USD42.17 (2008) respectively (Akpabio, 2012).

Water as an economic resource prevails on individuals to utilize it as a means to whatever ends they may have the economic and wherewithal to effect (Linton, 2010), as the case with commercial water vendors including industries**.** At household levels, the cost of accessing public water service may be unaffordable in terms of the resource availability, extension of the infrastructure to some areas, operational aspect, maintenance, overall investment and other associated expenditure (Kayser et al., 2013; Salami et al., 2013) as well as the level of income of the householder. Thus, some residential areas become excluded from the constructive life and livelihood bequeathed by water because the management at any particular time or place is on the basis of the influence of different social actors (Linton, 2010).

In improving water systems as per reticulation or similar actions, the preferred economic perspective is for the benefit to outweigh costs, depending on the definitions of costs and benefits including externalities: also, such investments are made on behalf of households with due consideration on their willingness-to-pay and other applicable viewpoints, including the upkeep of ecosystem services (Vairavamoorthy et al., 2008; Marlow et al., 2013). However, many benefits of adequate public water service management are quite intangible in terms of total economic value and so many individuals do not perceive them (Marlow et al., 2013). Therefore, there is need for further research in the economics of public water management to establish the accurate valuation of the services rendered.

2.4.3 Environmental Aspects of Water Management

The prevailing times require that every development challenge, which includes environmental protection, should pay adequate attention to water resources management because water is undergoing exceptional stresses with more demands for it for diverse uses by the increasing global populations (Salami et al., 2013).

The issue of water management is often somewhat affected by agricultural and environmental policy considerations respectively with each sector having its own institutions, mandates, proficiencies and approaches while dealing with the same resource (Ezeabasili et al., 2013; van Buuren, 2013). This is true of Nigeria whereby the water ministry has severally been merged with and demerged from agriculture but never with environment by different government regimes for administrative purpose. However, there are cities that have dealt with such issues if conflicting through effective governance strategies that ensure there is no crisis or duplication of functions in the sectors (McDonald et al., 2011).

The management of water resources demands addressing intricate natural and human systems, which in effect depends essentially on understanding the contrivances of ecological systems as well as on the established environments that form the perception and response of humans to dynamisms in ecosystems (Kim et al., 2015). However, there are emerging facts that adverse environmental changes in urban systems are occasioned more by anthropogenic

activities like indiscriminate disposal of solid waste, deforestation, land-use changes and agriculture than by the changing climate (Ezeabasili et al., 2013). Further, discharging waste water and faecal wastes into open rivers and lakes, especially those serving as potable water sources, swells the preponderance of pollution and if not adequately treated the latter effect will be contaminated water supply.

2.5 Challenges in Water Supply Management

The challenges encountered in public water service management are neither homogenous, nor constant or consistent overtime but vary from region to region and at times within single state from one season to another and one year to the other (Salami et al., 2013). The awareness of water scarcity and uncertainty has forced many city governments into re-thinking how to address such difficulties through comprehensive approaches that collectively engage multiple disciplines and stakeholder groups to enhance resilience and adaptation to these changes (Rijke et al., 2013).

Many at times, the efforts of government to self-manage the problems in the water sector tend to disrupt prevailing self-organizing capabilities of the private sector and society (Edelenbos and Teisman, 2013), creating further complexities of water problems.

The service delivery of potable water supplies in Nigeria is swamped by several challenges such as fragile public institutions, fragmented hierarchy, poorly managed data centres, poor regulatory capacity, paucity of funds, structurally-deficient administration, limited networking, uncoordinated management, poor implementation processes and inadequate response to emergent water problems (Goldface-Irokalibe, 2009; Ajai, 2012). Other challenges in the sector that need good governance approach include insufficient supplies, superseded infrastructure (especially of pipelines), dwindling funding, insufficient reticulation, leakages, trifling water tariffs, and water pollution (Tropp, 2007; Ajai, 2012). The challenges further include the effects from climate change (like scarcity) and the lack in backing up policy plans and the implementation with science-based knowledge and innovations (Dewulf et al., 2005; Ezeabasili et al., 2014). Also, there is hardly any stakeholder participation beyond the public sector in the development and management of the water programmes (Gbadegesin and Olorunfemi, 2009; Ajai, 2012). And in Abuja not more than 40% of the inhabitants have access to the public water service network (Abubakar, 2014).

Sufficient reticulation of water supplies can only be tenable by pro-poor policies but the conditions of accessibility to every household reveal severe deficits in poorer communities (Moretto, 2015), as the case of Lugbe District in Abuja that has no public water service though many of the inhabitants are middle-income earners. As a matter of fact within the water domain there are simple problems that can be easily resolved however, there are more wicked and complex water problems that need dealing with in a complex manner with actors at diverse levels, scale and domain (Edelenbos and Teisman, 2013). There are a number of methods and technologies for resolving water problems but the professionalism to implement these methods and technologies seems to be lacking severally (Tortajada, 2010; Edelenbos et al., 2013): it is a situation that is similarly observed with the FCT WB.

2.5.1 Uncoordinated and Fragmented Management

"Fragmentation and uncoordination in urban management is often not effectively countered by the efforts to integrate and synchronize, because every government level (pillar), agency (turf) and sector (public/private) is defending its own interest and responsibility" (Edelenbos

et al., 2013). Fragmentation could be functional or institutional or both could occur in a system. The former is when a variety of public and private organizations have different responsibilities for interdependent aspects of water management while the latter is because water management authorities have failed to coordinate within and across levels of government (Lubell and Edelenbos, 2013; Valdés-Pineda et al., 2014), both cases are peculiar with the FCT WB.

The management of the water resources in Nigeria is by the enactment of the updated National Water Policy of 2004 and is shared by the federal government (FMWR) at the apex of authority, 36 States (as SWAs including FCT WB) at cities level and for the suburban and rural communities by the 774 local authorities. The responsibility of the management was shared with the purpose to decentralize functions while allowing each government pursue autonomous water programmes that would meet the people's needs but this has degenerated to multiplication of efforts, fragmentation, and lack of coordination (Goldface-Irokalibe, 2009; Ajai, 2012) within the hierarchy. Moreover, this independence in pursuit of goals has been seriously stalled by insufficient funds to the state and local government levels making the service delivery virtually by the federal government through top-down approach. Therefore, the water management agencies, especially at States level, tend to have very low operative efficiency with unreliable statistics on the distribution lines, alongside high unprofessionalism in accounting for the services rendered including inadequate fiscal obligations, unenthusiastic workforces, highly lobbied tariff setting regime, outmoded and decrepit infrastructures as well as excessive anomalies in service provision amongst others (Akpabio, 2012).

Further, Akpabio (2012) criticized the deplorable situation of FCT WB being unable to provide equitable access and reticulation of potable water service to all districts within the geographical spread of Abuja. This is indicated by Kim et al. (2015) statement that, "despite longstanding recognition of the importance of institutional structure in resource management, little is known about how political fragmentation really affects resource management efforts in the field, and thus the outcomes (in terms of quantity and quality of resources)".

Another issue considered a necessary strategy for the FCT WB in enhancing her reticulation efforts is the development of linkages with actors in other government agencies (public sector), private sector, civil societies, and even NGOs. It is a strategy that recognizes the multi-sectoral, multi-actor, and multi-purpose affiliations of water management with such sectors as agriculture, power, health amongst others (Tropp, 2007; Tortajada, 2010; Edelenbos et al., 2013), but this seem not to be the case with FCT WB. Also, "political fragmentation in local governance can have a significant potential impact on water resource management processes and outcomes" (Kim et al., 2015), this is the experience with democratic governance with sequence of political leaderships exerting changes in the sector (sometimes) without regards for due process or laid down mandates.

2.5.2 Climate Change Impacts on Water Management

Climate change has become recognized as a potentially significant pressure on nature and her resources, which includes freshwater, therefore the management of the resource for urban systems should ensure equilibrium in the demand and the supply**.** The impacts of climate change on water resources can be direct and indirect, on both biophysical and socio-economic environments, which are evidently seen in several sectors like agriculture, health, and energy generation; with the tendency to exacerbate undue pressures on freshwater sources (Kusangaya et al., 2014). A government's ability to address uncertainties and shocks is vital for sustainable development, especially in these times of unprecedented climate and global changes (Pahl-Wostl, 2009).

The studies of several water regimes revealed that impending scenarios will have high hydrological uncertainties corresponding with global changing climate and this necessitates extending public water systems sustainably to adequately mitigate the potential impacts from climate change (Valdés-Pineda et al., 2014). Charlton and Arnell (2011) studied several articles concerning the potential impacts from climate change on freshwater resources and then categorized them into three broad areas as follows: -

a) exposure to climate change of water systems and the management structures with suggestion for potential adaptation strategies;
b) exploration of methods that incorporate climate change into water management by assessment techniques and management approaches; and
c) examination of practical adaptation strategies actually developed for implementation by water managers (the least of all the articles)

Again, Charlton and Arnell indicated that only a few studies, if any, have how organizations in any sector actually adapt to climate change, in view of the significant inferences attributed to climate change uncertainties for planning and future projections in potable water management. And within the matrix of climate change, freshwater resources has become a focal point such that if the changing climate is persisting forwards, the prospective impacts on freshwater are likely to increase in severity, range and scale (Kusangaya et al., 2014**),** a critical analogy that is of concern for adequate management of potable water reticulation to urban households.

2.5.3 Anthropogenic Impacts on Water Resources

Rapid urbanization have been observed to greatly influence the delivering of goods and services by ecosystems (Dobbelsteen et al., 2010; Ernstson et al., 2010), while the factors that shape urban systems invariably impact on ecosystems benefits to humans (Andersson et al., 2005; Jansson, 2013). A lot of pressure is exerted by urban dwellers on ecosystem services, which includes freshwater resources, and many do not realize this because they have no perception of ecosystem services nor is it tangible to them (Gomez et al., 2013; Buchel and Frantzeskaki, 2015). Freshwater resources are undergoing intense usage, so require regular hydrological checks to secure social, economic and environmental sustainability. Thus, it has becomes vital to have appropriate public policies that ensure an efficient governance system as well as science-based information on the availability of the resources in projected areas, considering the prevailing changing climate (Valdés-Pineda et al., 2014).

A real concern of anthropogenic activities on water resources is pollution; which occurs variedly via domestic sewage, solid waste and human defecation into surface water sources that serve as urban systems supply, which can as well as percolate into groundwater. Consequent to the preceding, an increasing population growth and socio-economic activities in urban systems should propel the public sector into providing safe and sustainable water supply with efficient management of the resources (Akpabio, 2012).

2.6 The Need for Water Governance

'Governance' as a term only recently became very significant in management spheres, including the water sector, from being misunderstood as a synonym for government in terms of steering state affairs. Moreover, it is a concept that expansively integrates government actors with other actors within the urban system from the private sector, civil societies and non-governmental organizations (Tropp, 2007; Scholten and Edelenbos, 2013).

"Water governance" as defined by the United Nations Development Programme (UNDP) of 2000, "refers to the political, social, economic and administrative systems that are in place to regulate development and management of water resources and provisions of water services at different levels of society" (Pahl-Wostl, 2009; Bressers and Kuks, 2013).

The diverse problems encountered in water resources management led Edelenbos and Teisman (2013) to the term "challenges of governance competency" with the argument that eluding water crisis is a major task burdened by complex challenges because diverse actors across domains, levels and sectors involved in the process tend to have definite interests, values and visions. In addition the interventions for the complexities in water systems are guided by several actors beyond the public sector rather than internal rationality leading to the concept of multiplicity. Also, modern water management display overlapping and obscured boundaries with the consequence that boundary crossing and spanning are now provisos essential for emerging governance capacity. The approach of water governance entrenches not only vertical responsibility but also horizontality and reciprocity**.** Thus, water governance is a multi-level, multi-process and multi-actor approach emphasizing connective capacity of individuals, instruments and institutions to counter fragmentation in water management by crossing boundaries (bureaucratic, organizational, professional, status and so on) and establishing linkages within an aggregate of actors (on different levels, at various scales and in numerous domains) in view of addressing water challenges (Edelenbos et al., 2013).

Again, water governance connects different frames, values and ambitions by seeking solutions that integrates and balances (conflicting) interests. The connective capacity of water governance aids connecting local government with the regional to the national**.** The complex and entwined nature of the water sector makes purely public institutions and procedures incapable of carrying out integrated and interconnected visions, plans, projects and programmes successfully, the ability to connect organizations and actors across different scales, levels and domains pave the elevation from water management to water governance (Edelenbos et al., 2013). Therefore, the complexities encountered in public water systems will be best managed not just by hierarchical modes of governance in a vertical approach but with the integration of the horizontal approach, network of actors and bottom-up (Scholten and Edelenbos, 2013; Edelenbos et al., 2013), but the prevailing management in the FCT WB is practically a top-down approach.

In essence the need for governance in potable water service management is predicated by the evolution that the public sector cannot solely address the prevailing challenges in water systems (Edelenbos and Teisman, 2013) taking cognizance of the impacts of climate change, anthropogenic activities, population growth and increasing urbanization.

2.6.1 Dimensions of Water Governance

Water governance as a concept combines a top-down perspective from the public sector with the bottom-up perspective of stakeholders participating in water management including the beneficiaries of implemented programmes/projects (Pahl-Wostl, 2009; Bressers and Kuks, 2013). Another perspective, though advanced, is adaptive water governance that stresses the need to use adaptive approaches in management to deal with complex water challenges (Edelenbos et al., 2013). And the approaches vary as flexible, inclusive, participative, bottom-up, erudite and reflexive taking cognizance of the complex nature of water systems (Pahl-Wostl, 2009).

The past 13 years have seen the Nigerian water sector carry out reforms that are the nation's translation of international neo-liberal discourse and policies. The dominant factors of these

reforms are full pricing of service, partnering with the private sector, demand responsive service principle, and the recovery of cost invested in service delivery (Akpabio, 2012). Therefore, the practical dimensions and processes of water governance should thrive for sufficient, accessible and sustainable development to end-users. This can be embraced from Frantzeskaki and Tilie (2014) "multi-level governance framework" applied to" urban ecosystems governance in Rotterdam city" with the pursuit for the city's resilience and sustainability**.** "Multi-level governance framework" is a concept that addresses the dimensions of "four levels of governance organization" that are sequentially strategic, tactical, operational, and reflexive. Although the case in view is of urban ecosystems governance, water being an element and benefit of ecosystem services can likewise be governed by the holistic strategies in this same framework to achieve sufficient distribution in an urban system.

2.6.2 Timing in Water Governance

Public water management requires integrated approaches (specifically a multi-actor network of government institutions, private sector, civil societies, non-governmental organizations and other stakeholders) for connective capacity to jointly advance optimal mechanism within aligned timeframes for effective water reticulation and to address the challenges of water systems (Scholten and Edelenbos, 2013; Wilkinson et al., 2013; Eshuis and van Buuren, 2014; Taylor et al., 2015).

The proponent of the importance of time in water governance innovations, Eshuis and van Buuren (2014), emphasized how vital an issue it is. The summation is that actors have different perceptions of time with private sector more pressured for time than the public sector that is more procedural or bureaucratic. However, there is power is managing time in governance processes because it is important for collaboration to void unnecessary delays, low involvement, postponements and diverse wastages so as to arrive at consensus on joint actions: whether short, mid or long-term goals. Even an assessment on the benefits accrued from the economics of water gives credence to time that was salvaged by better access to water services, having a contribution of about 70% benefits (Kayser et al., 2013). Thus, time management is very beneficial to the overall import of good urban water governance.

2.6.3 Features of Governance for Good Water Management

Tropp (2007) composed the features of governance befitting several sectors including governance in the water sector, as follows: -

a) An interactive process, at variance to formal institutions and/or regimes
b) Premised on accommodating rather than dominating in decision-making, enhancing progress in dialogue, networking and negotiations;
c) Enhances the vertical network of top-down hierarchy with horizontal networks;
d) Encourages government institutions and private sector to relate and interact for better governance outcomes;
e) Action-oriented for the common good of all and to address problems at all levels, scales and domains;
f) Considers authority as not necessarily of government but very crucial element in the approach;
g) Emphasizes organization, networks and relationships for collaboration in action
h) Flexible and integrates informal institutions, like networks, that usually escape formal government processes

2.7 Water Security

The 1990s was when the term "water security" emerged and it has garnered increasing attention over the last decades, in both academic and policy deliberations leading to its diverse definitions, promoted by some international organizations that include the Global Water Partnership during the World Economic Forum of 2008. Within this decade an integrative meaning of the concept was developed as affordable access of water for human needs and ecological health, thereafter four main categories were identified namely modelling (i.e. *policy-prone*) , empirical (i.e. *practical*), lab-based (i.e. *tested*) and conceptual (i.e. *logical*). Thus, water security as a term touches on a set of core concepts comprising resources, river, basin, management, areas; food, development, irrigation, change; development and model – these indicate the diversity of definitions from several analyses conducted across the social and natural sciences (Cook and Bakker, 2012).

In addition, Cook and Bakker admitted that the broad notion of water security and good water governance breeds reciprocal facilitation such that water security aims for good water governance; likewise good water governance necessitates water security at operational level to all households. Consequently, water service levels for humans with reduced health concerns rates as intermediate access at 50 litres/capita/day (L/c/d) to optimal at 100L/c/d and above: the latter entails water supply by several taps continuously to meet consumption and sanitation needs (Kayser et al., 2013). Thus, water security requires that the resource is available, accessible and sustainable in quantity and quality at all times to urban households equitably i.e. without status or gender discrimination. As reticulation of potable water supplies is sufficiently attained, it is then practical to group the levels into sequential and incremental rungs of improvement in service delivery and to establish a useful tool for planning, resource allocation and monitoring (Kayser et al., 2013) for good water management.

2.8 Governance Strategies for Good Water Management

The collective effects of the changing climate and anthropogenic activities makes former procedures of managing public water supply insufficient for further and effective reticulation of the service into deficient areas in the city, this should influence how the FCT W will assess the challenges and strategize implementation on a sustainable basis. There are two realities that are extremely important to consider in this regard namely the pronounced probability of changes in the natural water cycle that are seemingly unpredictable and the fact that rainfall is becoming increasingly irregular causing extremes (Vairavamoorthy et al., 2008).

Any strategy that ensures sufficient and sustainable reticulation to all areas in an urban system is a welcome development for good water management. In this regard, the approach selected to address the questions posed in this research work is the "multi-level governance framework" (Franzeskaki and Tilie, 2014) because of how it outlines management approach at different levels of development though in this case it is applied to potable water reticulations. This framework has four strategies that are termed "levels of governance organization", which are applied in sequence and integrates a recurring continuum that allows for changes, improvements and consistency regardless of tenures in political leadership. The framework is holistic to incorporate time management and to identify the collaborations, if any, between FCT WB and other relevant actors involved in the water reticulation process; these two areas are not clearly captured in the course of the review on the management approach of the FCT WB in operating the water reticulation in Abuja city. Accordingly, each

level of governance maps out actions and procedures with the focus to establish better potable water management by the public sector as summarized on Table 2.1 below.

Table 2.1: Summarized Strategies of Multi-level Governance

Strategies	Mapped Actions
Strategic	➢ Policy development processes, setting long-term goals, planning, visions creation, identity, culture and values of the city
Tactical	➢ Designing steering activities, funding, programmes and creation of partnerships and/or networks
Operational	➢ Implementation and management of policy action plans, infrastructure plans, and assets.
Reflexive	➢ Monitoring, assessment and evaluation of existing policies with consideration of impacts on social, environmental, ecological and economic aspects of the urban system.

Source: Adapted from Franzeskaki and Tilie, 2014.

2.9 Sufficient Potable Water Reticulation: Holistic and Conceptual Views

The need to address the complexities in the water sector have led to several holistic approaches such as the concepts of sustainable development, river basin management, integrated water resources management as well as water governance (Tortajada, 2010). These holistic efforts are supported by concepts like "connective capacity in water governance" (Edelenbos et al., 2013), "new capacity development" (Tropp, 2007) and "time management in water governance" (Eshuis and van Buuren, 2014). However, there has been no remarkable achievement in resolving the complexities encountered in the sector especially in developing countries hence bureaucrats and managers should endeavour to identify their specific limitations while prioritizing approaches to improve the management and governance of water resources effectively (Tortajada, 2010). The need for sufficient potable water reticulations to urban households in Abuja led to the adoption of the "multi-level governance approach" as the concept to explain what influence the management of FCT WB has on the development, as captured on the conceptual framework on Figure 2.1 below.

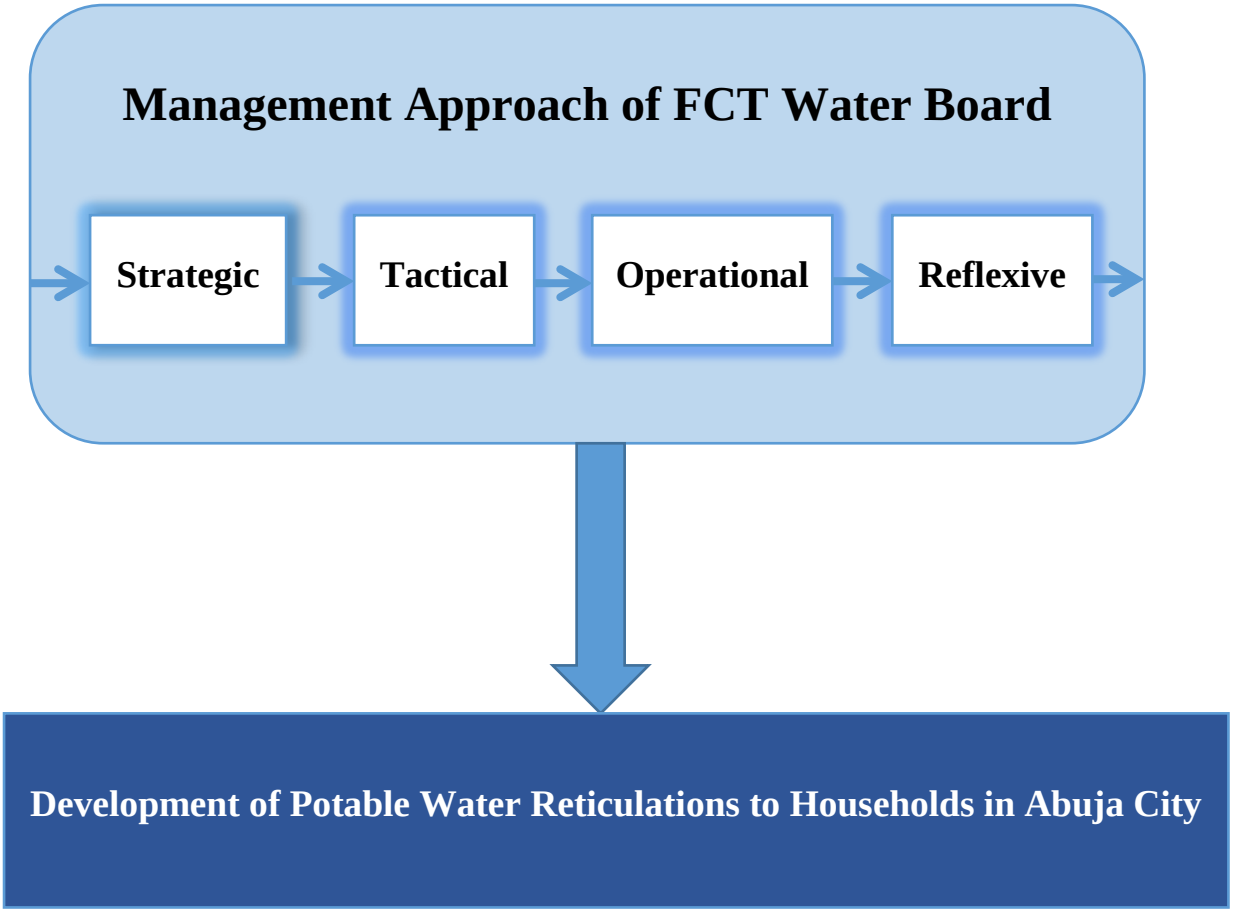


Figure 2.1: The Conceptual Framework: Management Approach of FCT Water Board on the Development of Potable Water Reticulations in Abuja.

Chapter 3: Research Design and Methods

The issues covered in this chapter include the revised research questions, operationalization of the concepts and variables drawn from the conceptual framework as well as the detailed chosen strategy and methodology for the research work.

3.1 Revised Research Questions

3.1.1 Main Question

In what way does the management approach of FCT Water Board influence the development of potable water reticulations to urban households in the Federal Capital City (FCC), Abuja - Nigeria?

3.1.2 Sub-questions

a. What approach is being implemented by the FCT WB in the management of potable water reticulations to the urban households?
b. To what extent has this approach involved other actors in the delivery of potable water supply to the households?
c. What strategies in the management approach explain the state of water reticulations in the city?

3.2 Operationalization: The Framework Concepts and Variables

The conceptual framework developed for this study was adopted from the "multi-level governance approach" by Frantzeskaki and Tilie (2014). The details of which was presented in the preceding Chapter 2 and to operationalize this concept the context used for ecosystem governance in Rotterdam has been contextualized for this water governance research in Abuja. The variables and indicators have also been directly adopted for the independent variable in addition to the causality of reticulations to the urban households as the dependent variable; the details of the operationalization are captured on Table 3.1.

3.2.1 Definitions of the Independent and Dependent Variables

A. Independent Variable

In this research work, 'management approach of FCT Water Board' is defined as the strategies that are used by the municipal water supply operator in delivering pipe-borne water to the houses in Abuja city, which are sequentially strategic (planning), tactical (steering activities), operational (implementing and managing), and reflexive (monitoring and evaluating).

B. Dependent Variable

Also, 'development of potable water reticulations to households in Abuja City' is defined as the service delivery of FCT WB for the city residents to have accessible and reliable pipe-borne water supply.

Table 3.1: Operationalization of the Framework Concepts and Variables

Concepts	Variables	Indicators	Respondents
Independent Variable (Semi-Structured Interview Guides)			
'Management approach of FCT Water Board'	Strategic	Setting long-term goals	Key informants in the FCT WB as well as in FCDA ESD and FHA (max. 5 professionals per actor group)
		Policy development processes	
		Planning	
		Creating vision	
	Tactical	Steering activities	
		Programmes	
		Establishing networks and/or partnerships	
		Information Sharing	
	Operational	Implementing policy action plans, infrastructure plans and assets	
	Reflexive	Monitoring implemented projects for impacts	
		Evaluating implemented projects for impacts	
Dependent Variable (Semi-Structured Interview Guide)			
'Development of potable water reticulations to households in Abuja City'	Accessibility	Most available domestic water source in the neighbourhood	Individuals resident in Gwarinpa district, Abuja (max. 5 persons)
		Most accessible domestic water source by the household	
		Distribution of municipal water points in the area	
	Reliability	Regularity of municipal supply	
		Quality of water supply	
		Quantity of water supply	
	Service delivery	Likely problems in supply e.g. shortages, burst and/or leaking pipes	
		Response of FCT WB to such problems, if any?	
		Rate of service delivery by FCT WB	

Compiled by Researcher, 2016

3.3 Research Strategy

The research strategy selected to explain the questions on what influence that the management approach of FCT WB has on the development of potable water reticulations to the urban households in Abuja is 'case study'. The case study strategy has been selected because it supports experiential observations as evidence for checking the applicability of concepts in substantiating the reason for the empirical context (Blatter and Blume, 2008).

This research work entails the empirical context in Abuja of an independent variable, the FCT WB, which cannot be isolated from its context and a large number of research units that are the urban households in the city. Also, the dependent variable which is "operations of reticulation of potable water supply to the urban households" is the causality from the FCT WB through an approach that entails four sequential strategies that lead to accessible and reliable water distribution. The study area is in Abuja, Nigeria's capital city and a modern urban system that has a development master plan (Abubakar, 2014), hence should be a prototype for sustainable urban service delivery.

The adequacy of the case study is enhanced by the use of qualitative research method, which leads to an all-inclusive understanding of the empirical situation (Kjellen, 2014) from the management to the reticulation end of the process. And since this is an empirical situation, the study will contribute to a deeper understanding of the processes and the causal effects through the in-depth interviews of 5 key persons in three distinct government agencies namely FCT Water Board (WB), FCDA Engineering Services Department (ESD) and Federal Housing Authority (FHA) including 5 residents who are beneficiaries of the municipal water reticulations making a total of 20 respondents for the in-depth interviews. A sixth respondent from the FCDA ESD gave an overview of all information variedly provided by the former informants. Also, maps on the distribution of the water supply in the city were collected separately from FCT WB and FCDA ESD as secondary data. Therefore, a form of articulated findings was developed to give valid answers for the questions in this research (Verschuren and Doorewaard, 2010).

The 5 residents dwell in Kado estate, the sampled area (Figure 4.3) and one of the housing facilities developed by the federal government for low to middle level civil servants, which is serviced by the municipal water supply. In Abuja the operator and manager of the municipal water supply for the entire city is the FCT WB. The essence of selecting case study strategy is to reveal the trend of the water service delivery that pertains to Abuja as the case in context, which cannot be generalized to other cities even in Nigeria. The practicality here is that logical conclusions can be gathered from the data on the input of the independent variable and the outcomes on the dependent variable (Blatter and Blume, 2008).

3.4 Sample Size and Selection

During the fieldwork, it was revealed that FCT WB is not the only actor engaged in the water reticulations scheme in Abuja. Two other actors namely the Federal Capital Development Authority, Engineering Services Department (FCDA ESD) and Federal Housing Authority (FHA) were identified. The former has the mandate for the infrastructural development, including water infrastructure, in the city while the latter develop housing estates with similar infrastructure across the Nation. And FCT WB has the mandate to operate and manage the entire water infrastructure in the city. This is the basis for adopting the three actor groups for the in-depth interviews. A sample of five residents in Kado estate of Gwarinpa district was adopted as well, making up four groups of interviewees. The selection of respondents was by non-probability, purposive sampling and by snow-balling for the professionals while for the

residents it was purely purposive. In each actor group, five persons were interviewed respectively as well as 5 residents to make up the sample size. In addition, there was an expert overview of the development phases of the water reticulations in Abuja from FCDA ESD making twenty-one interviews in all.

3.5 Sample Characteristics

The data collection method used for this research work is semi-structured interview guides, which were prepared respectively for a) FCT WB (*the principal actor group*); b) FCDA ESD and FHA (*the co-actor groups*); c) residents of Kado estate, Gwarinpa district (*the urban householders*). The residents were co-opted because they are beneficiaries and their response should confirm or disaffirm to a certain extent the type of service delivered by the FCT WB.

3.5.1 Interview Sample Characteristics

The total number of interviews conducted for this research work is twenty-one; however the twenty-first was just an overview of in-depth information given by the other five informants in the FCDA ESD – a kind of summary hence was not analysed by ATLAS.ti. The other twenty have been captured as four groups for the exercise; the profile of the interviewees is presented on Table 4.1 below.

Table 4.1: Profile of the Study Interviewees in Abuja

Actor No.	Organisation/ Residence	Gender	Position/ Occupation	Duration in Position/Residence
1.	Water Board	Male	Managerial cadre	5years
2.	Water Board	Male	Managerial cadre	3years
3.	Water Board	Male	Managerial cadre	Some years
4.	Water Board	Male	Managerial cadre	5years
5.	Water Board	Male	Managerial cadre	2years
6.	FHA	Male	Town Planner	3years
7.	Kado estate I	Male	Private Entrepreneur	6years
8.	FHA	Male	Managerial cadre	2years
9.	FHA	Male	Managerial cadre	8months
10.	FHA	Male	Field Engineer	2years
11.	Kado estate I	Female	Retired civil servant, in private business	20years
12.	Kado estate I	Female	Civil servant	20years
13.	FCDA	Male	Directorate cadre	>1year
14.	FCDA	Male	Directorate cadre	3years
15.	FCDA	Male	Directorate cadre	2years
16.	FCDA	Male	Field Engineer	>1year
17.	FHA	Male	Technical Officer	4years
18.	FCDA	Male	Field Engineer	3years
19.	Kado estate I	Male	Student	17years
20.	Kado estate II	Female	Teacher	10years

3.6 Validity and Reliability

For case study the internal validity is crucial because it entails in-depth interviews of key informants. Validity means authentication of information given and this was addressed via transparency and balance in reporting the answers given by the respondents who are actively involved with the causal process (Neuman, 2006). Further validation entailed checking the findings and interpretation of the interviews on the professionals (Verschuren and Dooreward, 2010) with responses from residents and observations in the catchment area that supported the empirical situation.

The reliability of case study is usually threatened since social processes are generally not steady over time (Neuman, 2006) but this was adequately addressed by testing the interview questions before actual interviews. Also, by the transparent conduct of the exercise in documenting the entire research procedure in a logbook and recording every interview with an electronic device (with the permission of each interviewee). Also, the interview questions were precise to issues pertaining to the conceptual framework for reliable analysis and to give valid answers to the research questions (Verschuren and Doorewaard, 2010).

3.7 Data Collection Methods

The data collection methodology for this research fieldwork was by semi-structured interview guides, which were formulated separately for the principal actor FCT WB, the co-actors FCDA ESD and FHA as well as for the residents in Kado estate. The sampling was purposive with the informants in respective agencies categorized as a group while the residents made up the fourth group. It entailed snowballing from one key informant to next within the same actor group except for the residents' that was purely purposive. It was an in-depth data generating process based on the varied respondents' deep knowledge and opinions of the on-going situation (Sandelowski, 1995). The semi-structured interview guide was an adequate tool for the exercise since some understanding of the prevailing situation was known but required a broader degree of additional information to analyse the causality. The analysis of the data from the in-depth interviews was by qualitative processing (Verschuren and Doorewaard, 2010). The use of additional data from the organisations is supported by Toit (2015) 'hybrid sources of data', which is the use of primary and secondary data in a study.

3.8 Data Analysis Method

The method used for analysing the data from the interviews conducted during the fieldwork is the software "ATLAS.ti". First, the interviews were each transcribed from the recorded versions and subjected to the software applications by first coding the content in related quotations by quotations. The codes were then grouped into families that relate with the conceptual framework and are relevant to the research questions. All the workings on ATLAS.ti were necessary to give content and valid explanations required for the qualitative research process.

Chapter 4: Research Findings: Potable Water Reticulations in Abuja

This chapter is a compendium of the processed data from the field work, which are expressed in text to explain the status of water reticulations in Abuja and the reasons from governance perspective. The explanatory mode is the attribute of qualitative research method. The chapter will conclude with relating the data content with the conceptual framework adopted for this study.

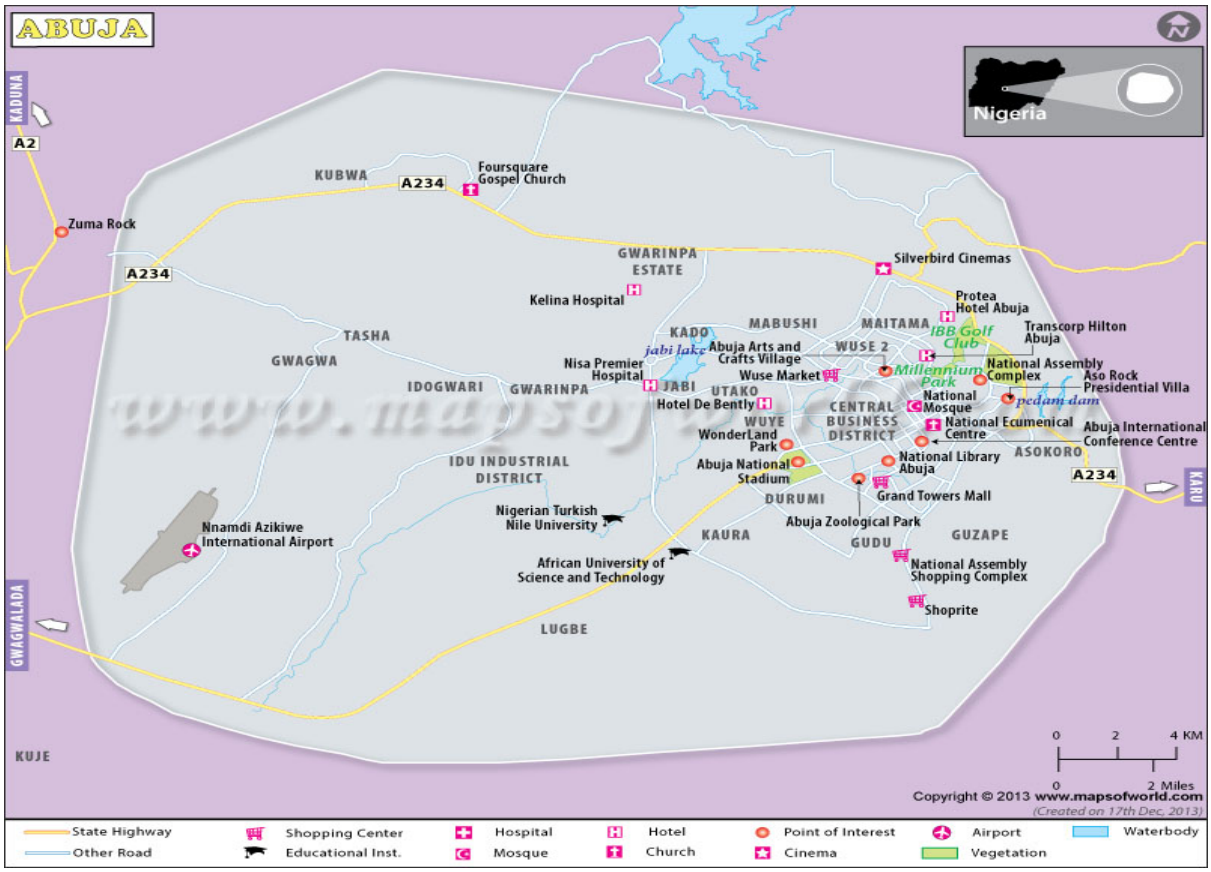
4.1 Study Area: Gwarinpa District

Abuja, the capital city of Nigeria (Figure 4.1), is reckoned to be one of the fastest growing urban systems in Africa due to incessant in-migration of people on the grounds of limited economic ventures beyond major cities leading to many seeking better economic opportunities, urban life and safer havens in the city (Abubakar, 2014). And according to Abubakar, this unprecedented population explosion makes Abuja the fourth busiest and largest urbanity after "Lagos, Kano and Ibadan". Characteristically, any city experiencing such unprecedented growth gradually gets stressed in diverse ways from the environment, social to the economic, and even the governance. One of such stresses happens to be water reticulations even when there is no scarcity of the resource because the reticulation has to do with the installed infrastructure and the spatial distribution in the city.

Source:https://nl.search.yahoo.com/yhs/search?ei=UTF-8&type=avastbcl&hspart=avast&hsimp=yhs-001&p=Maps+of+Nigeria+and+abuja

Figure 4.1: Map of Nigeria highlighting Abuja

Abuja enjoys the singular privilege of being the city in Nigeria with a Development Master Plan (Figure 4.2) as well as a Water Supply Master Plan (WSMP); the former is in 5 Phases while the latter is in 6 Phases according to professional information from the FCDA ESD. This agency under the supervision of the Federal Capital Territory Administration (FCTA) has the mandate for infrastructural development in Abuja alone. And the infrastructural development entails roads, electricity, culverts, drainages, sewerage systems including water reticulation. Another actor group involved in the water reticulation scheme is the Federal Housing Authority (FHA), an agency under the supervision of the Federal Ministry of Power, Works and Housing. The mandate for FHA is estate development for low to medium income earners across the nation. The principal actor is the FCT Water Board that has the mandate to operate and manage all water reticulation in Abuja, whether installed by FCDA ESD or by FHA. From the foregoing, it is seen that FCT WB has no mandate to install water infrastructure but to operate the facilities. Also, in operating the reticulated water they bill for the services and generate revenue hence beneficiaries perceive them as the only service providers in the water sector. The FCTA is also the supervisory Ministry for the FCT WB.



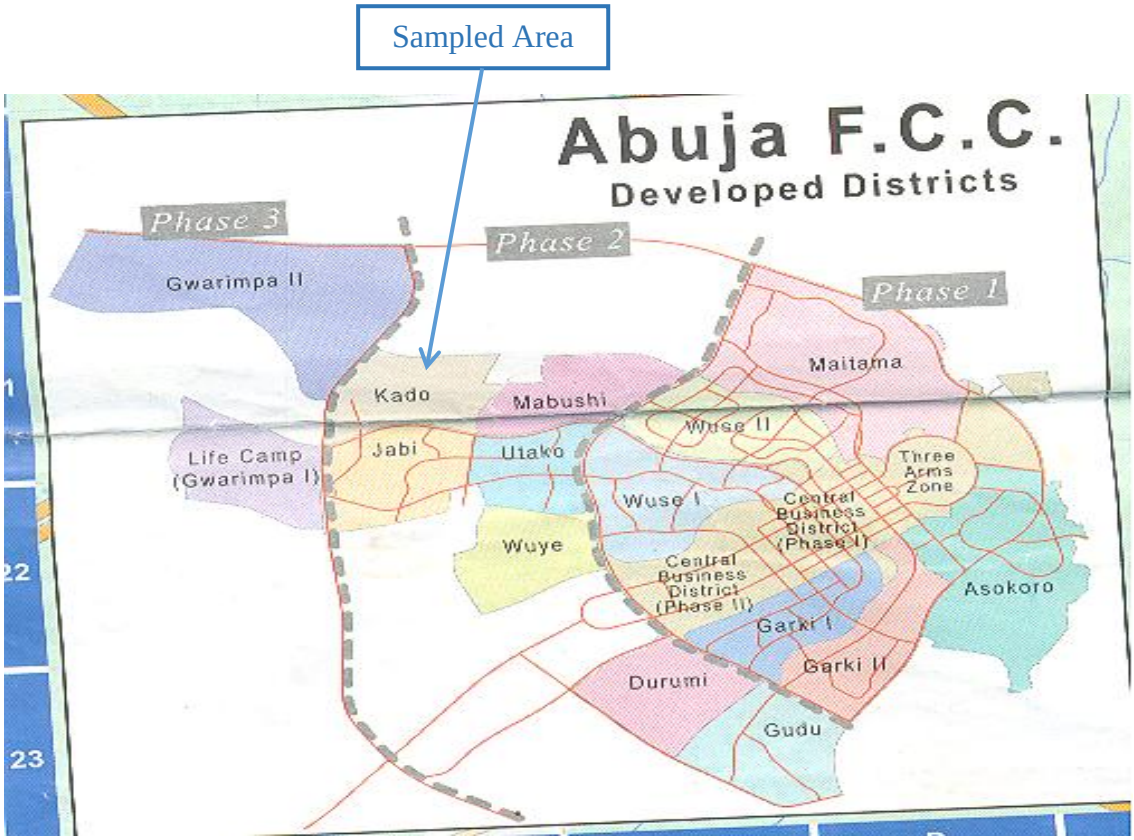
Source:https://nl.search.yahoo.com/yhs/search?ei=UTF-8&type=avastbcl&hspart=avast&hsimp=yhs-001&p=Maps+of+Nigeria+and+abuja

Figure 4.2: Map of Abuja, FCT Nigeria.

The reality on ground is that certain areas within the phases of development in Abuja are reticulated while others are not; the selection of Gwarinpa district for this exercise is because there are estate facilities developed by FHA, water reticulations exist and FCT WB manages the operation. Gwarinpa district was benchmarked against Lugbe district since the latter has

been observed to lack water reticulation, and this was confirmed all through the interviews, especially by the professionals.

The five respondents interviewed from Gwarinpa district are all resident in Kado estate, one of the earliest housing facilities developed by the FHA in Abuja. Kado estate, though in Gwarinpa district, falls within Phase 2 of the FCC development master plan (Figure 4.3) and it is categorised as Gwarinpa I, a broad area operated by FCT WB Jabi Area Office. The estate is for residential purpose equipped with activity centres (like a market, shopping mall, mosque, park); apportioned into Phase 1 and 2, fully reticulated and has about 800 units of houses that were diversely bungalows and duplexes. Currently, some of the duplexes have been made into separate residential flats or for other business purposes like laundry, restaurant, etc. Thus, water demands will essentially be higher than planned in this estate.



*Source:http://www.nairaland.com/attachments/136706_FCT_PHASE_12__3_MAP_***jpgc6f0bcd14868ce13096b574d7d91b9a5**

Figure 4.3: The layout of the First Developed Districts in Abuja

Figure 4.3 is a layout of the first three phases of development and the districts that were first developed in Abuja FCC. The arrowed Kado area is the location of Kado estate where all the residents interviewed for this study live, though in Phase 2 of the city's development but for potable water reticulations categorized as Gwarinpa I (like the indicated 'Life Camp')

4.2 Results on the Management Approach of FCT Water Board

The independent variable in this study is the 'management approach of FCT WB' which influences is being researched to explain the causality on the dependent variable with the information analysed by ATLAS.ti based on data gathered from the fieldwork. Consequently,

the results of the analysis are discussed in line with the concept of 'multi-level governance framework' operationalized in Chapter 2 of this thesis.

4.2.1 Strategic Management Level

The actor groups directly responsible for potable water reticulation schemes in Abuja, the Federal Capital City of Nigeria from the in-depth interviews conducted are three namely: - Federal Capital Territory Water Board, Federal Capital Development Authority Engineering Services Department and the Federal Housing Authority. While the latter two engage in the infrastructural development at diverse stages, the FCT WB takes charge of the operation and management as well as the billing to generate revenue for the Federal Government from the beneficiaries. The beneficiaries in this research are the FCC dwellers who have access to the water supplied by the FCT WB. However, this research concentrates on the operation of the reticulated water by FCT WB even though the water management starts from the source, the 'Lower Usuma Dam (LUD)', through filtration and treatment plants then through distribution networks and lines before reaching the beneficiaries, termed the urban households, in the city.

Typically, every government organisation in Nigeria is formulated based on policies and goals that are expected to bring the dividends of democracy to the citizenry through good governance, equity and resource management. The strategic approach for the water reticulation operations is garnered from the policy goals and decision making patterns of the FCT WB; this is supported by water infrastructures installed in the FCC by the FCDA ESD and in some housing facilities by the FHA.

A. Policy Goals

For the FCT WB, the respondents diversely stated the policy goals as aim, primary objective and goal with the clear intent that the provision of very clean potable water to the people resident in Abuja and to generate revenue for the federal government through the service delivery of the water. This was so presented by one of the respondent, clearly indicating the purpose of the Area Offices established in the districts that have water reticulation in the city. "The aim of the Board is to be able to take potable water to the citizens of the Federal Capital Territory (FCT), *while this office concerns those residing within Gwarinpa District* [emphasis added], at affordable rate. This means quality drinking water that goes a long way to reduce diseases and sicknesses of the citizens" (1st Respondent).

For certain, a long-term goal for the FCC is the installation of water infrastructure as well as other infrastructure in all the districts in a phase by phase manner as depicted by the layout map of the city (Figure 4.3). Hence, the advantage of having a development master plan that guides the responsible agency to take strategic steps in achieving gradual progress.

For FCDA ESD in terms of water reticulation, the main goal is ensuring water is readily available in every area of the city so that residents in the FCC can access potable water; this is attained through installing the water infrastructure from the source [LUD], the treatment plants [also at the dam] and the latter primary and secondary reticulations. The primary reticulation is known as the main line while the secondary reticulation takes the water from the main line to the point that individual houses can connect by tertiary reticulation. The tertiary reticulation is mostly done by FHA in their estate facilities or by FCT WB for respective houses. Hence, an answer from this actor group was, "When you talk of reticulation I want to understand if it is within the districts infrastructure! If yes, the policy of FCDA is that the *water reticulation goes with the provision of other infrastructures like roads, bridges, culverts, sewerage systems and electricity* [emphasis added] within the

districts as a complete package. These infrastructures are not provided separately" (15th Respondent).

Another response that substantiated that there is a Water Master Plan for Abuja is, "The policy orientation of the FCDA on water is to meet the demand of the growing population in the FCC in line with the provision of the *Abuja Water Supply Master Plan* [emphasis added]. This will help to prevent water borne diseases; stimulate a stable healthy environment, create employment and enhance the economic growth" (13th Respondent).

In the course of the interview it was also confirmed that FHA is one of the organisations involved with water reticulation in the FCC, according to one of the respondents, "The goal of FHA is to provide water and electricity in all the houses of her estate development as a complete complement of infrastructures" (8th Respondent). In addition, another respondent stated, "Every housing development without water, which is an essential commodity in one's life, has no value. So FHA as an organization decided to take that into consideration and ensure that every of our estates, whether there is water distribution or not from FCDA or FCT Water Board, has water reticulation as a complete package" (17th Respondent). The option such cases is an industrial borehole.

B. Decision Making

There are two types of decision making in respective agencies, one is by the management and the other is by Board Committee, both are equivalent to 'top-down' approach. The management type entails different levels of decision-taking from the professional in the field to the managers in the office and thereafter through the heads of respective agency to the Permanent Secretary and finally to the Minister. The Permanent Secretary is the career civil servant heading a Ministry and is regarded as the chief accountant of the Ministry while the Minister, the overall head, is a political appointee. The Minister is then the administrator of a Ministry.

A reporting line given by a respondent in FCDA ESD goes as follows, "[…] decisions are taken at different levels, there are Divisional and Departmental levels. We have the Chief Resident Engineer and we have the Engineer at the Project level in the course of the construction decisions have to be taken, there the Chief Resident Engineer takes such. If it is above his capacity, it is transferred to the Departmental level and if beyond that to the Executive Secretary. From the Executive Secretary it gets to the Minister" (16th Respondent).

The pattern presented for the Water Board is, "decisions are taken by the Director and the Head of Departments in the agency (these are the decision makers or management of the Water Board) […] There is a second type of decision-making called Joint Management meeting of Managers and Heads of Departments, which holds every 2nd Tuesday of the Month where information is passed" (2nd Respondent).

A typical situation is that each organisation usually has a Board Committee, which is chaired by the Head (i.e. Director of FCT WB; Executive Secretary of FCDA; Managing Director of FHA) but the current federal government had dissolved all Boards of such organisations and at the time of the interview had not reconstituted new ones. This is confirmed by the statement from FCDA ESD, "formerly when we had a Board, the members meet to approve the proposals but the former has been dissolved so this function is taken up by the Executive Secretary." (18th Respondent). A further confirmation is, "we used to have Board of Directors and a Chairman who take decisions on behalf of Water Board but this has been scraped by

the present government and a new Board is yet to be formed. We now report straight to the Permanent Secretary, who takes the reports up to the Minister of the FCTA" (1st Respondent).

4.2.2 Tactical Management Level

The tactical management level of FCT WB in operating the water reticulation is seen as the plotting stage to ensure funding is adequate for the process to be feasible and that other relevant actors are effectively networked with. The essence of this strategy is to maintain the reticulated areas while trying to expand the service delivery to other parts of the city. In the course of the interviews four core issues were identified for this management level.

A. Funding for Water Reticulation and Operation Activities

Funding is very critical for any programme or project by government to be planned and thereafter implemented. In the course of the interviews it was noted that each actor group had peculiar funding mechanisms for their respective activities regardless of the co-functions they exhibit. In the FCT WB, though they generate revenue from the water reticulated to the urban dwellers through a metering and billing system this revenue is not ploughed back into her activities. The revenue goes into the federal government's Treasury Single Account (TSA). The Water Board depends on the budgetary allocations from the federal government through their supervisory Ministry, FCTA to the Director and thereafter to the Area Offices in the districts with reticulation. As stated by the 1st Respondent, these funds are released by the Director as impress and running/operational cost while there is a stockpile of fittings and pipes at the LUD in a store for maintenance of the water infrastructure.

FCDA is "[…] funded from the annual budgetary allocation" (16th Respondent). And according to the 13th Respondent, "FCDA is funded from the Federal Capital Territory Administration (FCTA) statutory budget and the national budget, the national budget has been passed but [sic] of our projects are [funded] by the statutory budget. Like the States, FCTA is equally [one hence,] we are funded by National Assembly and we have some other projects under the statutory budget".

The case of the FHA is quite different because according to the 9th Respondent their *estate* [emphasis added] projects used to be funded by the government but now they source loans and other funding like selling the houses built to finance their activities. This was confirmed by the statement, "For over 10 years now we have been commercialized i.e. FHA source funding for their projects and after development, sell and plough back into the activities of the Agency. This is what is used to also pay workers (about 600 of us nationwide) remuneration, which has been regularly paid." (10th Respondent)

B. Actors Joint-Activities in the Water Sector

According to the 1st Respondent, "FCT WB collaborates regularly with FCDA ESD, since they are in-charge of the infrastructural development in Abuja" […] "and it is only where they [*i.e. FCDA*] have provided that the Water Board can come in and take charge of the operations". Again he said, "water reticulation, itself, is not the primary responsible of FCT WB, there is a supervisory agency called FCDA responsible for providing infrastructure in all the Districts of the FCT. Gwarinpa Estate was developed by FHA under the former Federal Ministry of Housing and Urban Development, who constructed the reticulation as well. FCT WB through the intervention of the World Bank (WB) was able to do rehabilitation and extension of the reticulation done by FHA before taking over the operations and

management." The above statements sum up the other four respondents' comments from the Water Board on the co-activities with FCDA and FHA.

This was collaborated severally with statements made by professionals in the FCDA ESD and one of such is "When the infrastructure is handed over to the Water Board it is with as built drawings because all we do is the construction" and added "another area we come in is in future expansion of the infrastructures but FCT Water Board is usually notified before we commence on that" (10th Respondent). Another said, "FCDA ESD does the job of installing the water infrastructure by awarding the contract and supervise. In the course of the project, FCT WB usually has 2 or more representatives in the team during the construction. At the end of the contract and the project is commissioned Water Board is handed the water installations to operate and maintain" (15th Respondent). Further, the joint-activities entail FCDA ESD coming to the rescue of FCT Water Board whenever there are technical problems beyond the former's capacity to handle. An example was given of when a heavy downpour washed up some major pipelines at Dutse [one of the suburban districts in Abuja] the Water Board had to call in the FCDA ESD to fix the problem (14th Respondent).

In another interview, one of the respondents stated that the joint-activities between FHA and FCT WB is an indirect collaboration. And the statements go like this, "Indirectly FHA collaborates with FCT WB after installation of the infrastructure; FCT WB has the mandate to give water and collect the bills. So they provide the water and put in place metering devices that aid the billing system. […] the handover of infrastructure does not entail any ceremony but a formal handover of the drawings" (9th Respondent).

In summation, it seems there is less networking between the FHA and the FCT WB during project installations unlike that of the FCDA ESD with the statement, "actually, we have indicated that it should not be the responsibility of FHA to provide roads and other infrastructures in our estates. We have indicated that all the infrastructure we install in our estates, including water, should be quantified and remitted to us before taking over the facilities" (6th Respondent).

C. Information Sharing

Within each organisation, from the interviews it was noted that information sharing is usually from the management team to the other staffs, typically top-down. Though in FCT WB a respondent stated that the reporting system is bottom-up, from the professionals in the field to their supervisors in the offices then through the Director to the Permanent Secretary and thereafter the Minister (1st Respondent).

The 14th Respondent who is of the FCDA ESD emphasized that water infrastructure installation by them cannot commerce except FCT WB is informed. And this is because the latter's staff form part of the installation team from the commencement so they can smoothly carry out their mandate of operating and managing the infrastructure. The 10th Respondent from FHA stated that, "we share information in the course of the project to know where the estate can hook up with the mains, on the pipe sizes and the shortest/most workable route that will not obstruct other infrastructure or future developments".

However, there was a major complaint by the 18th Respondent that information sharing from FCDA ESD to FCT WB is very thorough and they cannot neglect to do such but the reverse is the case from Water Board to them. He stated that there have been several instances of FCT Water Board handling projects without informing them the custodian of the infrastructure though the former has custody of the operations.

D. Other Forms of Collaboration

In the water sector beyond the collaboration of FCT WB with FCDA ESD as well as FHA to a certain extent, it was reported that other forms exist especially with international donor agencies. It appears that the private sector is not reckoned with by any of the organisation especially with FCT WB since they do not handle the infrastructural development *per se*. For example the 5th Respondent from the Water Board stated, "The only kind of collaboration so far that I know has been support from overseas like from the Japan International Cooperation Agency (JICA). […] Our collaborations are through our mother Ministry, FCTA which helps to coordinate the concerned Departments, Agencies, and Donors". Other respondents in the Water Board also confirmed that the organisation is currently collaborating with JICA to reduce the non-revenue water, which is termed wastages, in order for the revenue generation to be commensurate with the water supplied to houses. Another interesting input from a FCT WB staff was, "Water is a global issue hence the coming in of the WB to assist the FCT WB and recently JICA, so far that's all am I aware of in terms of International Bodies' involvement with the Agency but no private sector partnership" (3rd Respondent).

The other clearly stated partnerships in this light by the FCT WB are, "In Gwarinpa the reticulation carried out by FHA was bad hence it took 10 years to rehabilitate it when Water Board had partnership with World Bank. Also, the agency has received aids from JICA but that did not involve Gwarinpa. Another source has been from DFID which involve all FCT Water Board to carry out assessment. […] The Government is looking up to the Chinese government for soft loan" (2nd Respondent). The issue of Gwarinpa estate (as different from Gwarinpa district or Kado estate) is affirmed by the 1st Respondent with the statement, "FCT WB came to the rescue through the intervention of the World Bank and provided the estate with water reticulation".

Also, in the FCDA there is an expected partnership with the Chinese in form of soft loans from the government and technical support from their company to expand the city's reticulation system. Another input on the matter was, "most of the international bodies partnering with FCDA are asking to give soft loans i.e. Chinese, Biwater, and African Development Bank (AfDB) through the Economic Planning Research Studies (EPRS) to give about $300,000,000.00 for development projects, about $4,000,000.00 is coming to the city. They want to upgrade some slums/villages the main core villages like in Dutse Alhaji, Gwagwalada as well as Kuje [these are satellite towns beyond the city]" (18th Respondent).

There was nothing of such collaboration from FHA respondents while the private sector involvement from the FCDA ESD view is, "private developers are to do what we call tertiary infrastructures in such areas while we do the primary and secondary. So when we come to such housing facilities to put the source for them to connect but before then they have to go to Water Board to pay the necessary fees for the connection. The meter will be installed at the main point of connection or on each point of respective houses a meter is put so that the billing and revenue collection will be individualistic" (13th Respondent). It summarizes that the private sector is only perceive as implementers, whether on government contract or individual hire, not as partners.

4.2.3 Operational Management Level

The operational management level is seen from two aspects in the water reticulation scheme, the implementation of infrastructure for the service as well as the takeover of the service by the FCT WB and the operations from thereon, otherwise called service delivery, by ensuring regular and sufficient supply to all houses that are connected to the municipal lines.

A. Implementation Process

The implementation process for the potable water reticulations commence from the installed infrastructure at LUD (the source of supply) through treatment to the storage facilities thereafter to the distributive networks before getting to respective houses.

A detailed description given from FCDA ESD is, "We have what is called the Water Master Plan which makes provision for 6 treatment plants located at LUD, which is the source of raw water for the city. This source is augmented by an inter-basin water transfer from Gurara dam in Kaduna State. The first phase of this inter-basin water transfer has been done. Meanwhile, of the 6 treatment plants of total capacity 30,000cubic metres/hour Phases 2, 3, 4 and 5 have been fully constructed but 1 and 6 are under construction. Incidentally, the tanks are conspicuously located on hills around the city and there are 10 tanks that cover Phases 1 to 4. Tanks 2, 3, 4 and 5 have been constructed but tanks 1 and 6 are under construction. And our rising mains from 'LSD' carry water to these tanks and from there the water is distributed to the city. Each tank is linked to a loop i.e. Tank 1 is linked to Loop 1, Tank 2 to Loop 2, Tank 3 to Loop 3 up to Tank 8 linking Loop 8. So these Loops 1, 2, 3, 4 to 7 and 8 cover Phases 1 to 4. Phase 5 was a latter creation by Obasanjo administration to take care of the expanding population growth of the city. The plan is ongoing so the water infrastructure for that area has not even being designed. Lugbe seems to fall under Phase 5 while Gwarinpa is in Phase 2. Out of this development, depending on the situation we take decisions such that Loops 3 and 4 has been completed, part of Loops 2 and 5 have been done but Loops 1 and 6 nothing done yet while Loops 7 and 8 are being designed.

These Loops serve the Phases i.e. 3 and 4 are serving Phase 1; 2 and 5 are supposed to serve Phase 2; 1 and 6 will serve Phase 3 while 7 and 8 will serve Phase 4. But what happens is that these decisions are supposed to be taken *sequentially* [emphasis added] as we are making progress but interest can take development out of sequence. Hence, we will now be compelled to take water from Loops 3 and 4 to somewhere in Phase 3, in short taking water from Tanks 3 and 4 which is not supposed to be. The sequence of development should have been 3 and 4 followed by 2 and 5 then 1 and 6 as we are progressing and as population increases the water demand increases. That is why we were developing sequentially from Phases 1 and 2, 3 then 4" (13th Respondent).

Another input on the implementation by FCDA ESD is, "For us in the Engineering Services Department […] we have what is called [the] Water Master Plan that was designed about 30years ago (1980 or so) by Celotti, a foreign construction company – this actually gives us what we need to do about water in Abuja, in terms of the treatment plants and associated mains to the loops. So far with the treatment plants we have done 4 now, I can say that makes about 66% of the entire plan. But in terms of the capacity I can say 50% because what is on ground now is a total capacity of 30,000cubic metres/hour. And what we need is another 30,000cubic metres/hour from tanks 5 and 6 which are undergoing construction" (18th Respondent). And to confirm that FCDA infrastructural development extended to Gwarinpa district is the statement by the 14th Respondent that, "[…] Kado estate infrastructure was done by FCDA".

For FHA according to the 8th Respondent, water infrastructure falls into the mechanical aspect of their activities with designs for both primary and secondary lines. The primary lines are the big pipes along major roads while the secondary are the smaller pipes into respective houses in the estate facilities they develop. Again, the 9th Respondent stated that whenever FHA provides a facility they ensure that the infrastructure is sufficient for the houses. However, from the FCDA ESD it became known that water reticulation extends to tertiary lines [the type termed secondary lines by FHA] with the statement, "generally, water

reticulation is divided into primary, secondary and the tertiary lines respectively, the latter are what is installed for and within houses. The primary lines starts from the LUD from there the raw water is produced and treated, [thereafter transported to storage tanks]" (15th Respondent). Then the 9th Respondent stated that FHA ensures that in all their facilities that each house has sufficient water infrastructure for reticulation, which also applies to Lugbe estate (though no service delivery by the Water Board) with the statement, "within the estate we have installed the infrastructures in the ground" (10th Respondent).

For the FCT WB, their implementation process usually starts at the secondary or tertiary lines. Thus, "the major network for the distribution is secured in such a way that the major pipelines is over 2metres buried well into the ground and anchored with concrete […] even where the infrastructure is provided, in most cases the connection is not made to individual customers until they come to seek permission for house connections. From that point, the person has become a customer and the data is captured, processing for the connection to be made because of this we have Area Offices only in districts where our services are existing" (4th Respondent). This respondent also stated that there are two types of pipes used by Water Board for water reticulation, which are "[…] ductile iron pipes of size ranging from 400mm to 300mm then 200mm to 100mm […] and upvc [universal polyvinyl chloride] pipes", the latter is what was used in the reticulation of Kado estate.

B. Operational Process

According to the 2nd Respondent from the FCT WB, "[…] Abuja is blessed to have a source, LSD that supplies under [sic] gravity after treatment. About 80% of the distribution is under gravity so there is hardly any power needed for this activity". This was corroborated by the 4th Respondent with the statement "In FCT water is distributed by gravity that is at zero cost, no need to pay for fuelling and no need for pumping machine".

The installed facilities for operating the potable water reticulation are "The loop system […that] supply all areas of the city with potable water [supported by] two treatment plants both in Phase 1 and Phase 2 [….] [of] capacity [for] producing treated water of 5,000cubic metre/hour each, making a combined capacity of 10,000cubic metre/hour, then a treatment plant […] in Phase 3 and in Phase 4, each 10,000cubic metre/hour making a combination of 20,000cubic metres/hour" (4th Respondent).

The obvious in this case is that the FCT Water Board has the sole mandate to operate all water reticulation service in the whole of the FCT. So concerning operating the facilities developed by FHA, a response was, "There is a memorandum of understanding between FHA and the FCT WB on carrying out maintenance of the water infrastructure in the estates developed by the FHA. […] However, whenever there are maintenance issues that require our support since it is our estate we readily attend to such because it also behoves on us to maintain the entire estates" (8th Respondent). And the maintenance is enhanced by a stockpile of materials in a store at the LSD used to fix pipeline leakages and burst pipes when such occur.

The idea that metering the water reticulated by the FCT WB is a recent improvement in order to adequately bill beneficiaries was provided by a resident who said, "It was about 2004 that the water was installed [in Kado estate] and only about 5 or 6 years ago they came to fix meters for the billing system" (20th Respondent).

Another aspect of the operations is the maintenance such that "the water is generally taken when they want to clean the lines or tanks but the residents are usually notified beforehand". Another concern is how problems of leakages and burst pipes are addressed in the course of

operations. To this was the statement, "such problems as leakages and burst pipes is not common but when it happens as it did some time ago when some men at work in our compound burst the main pipe, we reported to the Water Board and the repair was done within 24hours" (11th Respondent). The latter supports what a staff said that, "as for management of the reticulation there is no problem even if there is a problem we make sure it is fixed in record time" (4th Respondent).

FCT WB is a revenue generating organ of the government through billing the respective households that access water reticulation from her service delivery. This billing system used to be estimated in terms of location and house size but the introduction of the metering system has greatly improved their operations and is helping to curb illegal connections to the mains as well as penalise defaulters. Usually the penalty is disconnection from the mains as confirmed by, "[…] today our men have gone out to disconnect customers who have refused to pay or have allowed their bills to accumulate. Officially, we give a grace of 10days to customers to pay their bills. Actually, disconnection is a last resort and sometimes our staffs do interact with such customers to encourage them to pay up to void being disconnected" (4th Respondent).

However, like many revenue generating bodies in Nigeria the bills paid by customers are collated and remitted into the Treasury Single Account (TSA) instituted by the present administration of Buhari. The TSA was established to curb mismanagement of government funds and curb corruptible practices by civil servants and even bankers, thus enhance availability of funds for sustainable developments.

4.2.4 Reflexive Management Level

Reflexive management entails discerning what is replicable in the course of overseeing a project or a programme for expansion or what should be changed in order to bring about better service delivery. The approach understood to attain this level of management is through monitoring and because water reticulation is people oriented, through beneficiaries participation.

A. Monitoring Process

Basically, the monitoring process has been upgraded by a metering system that ensures adequate revenue is generated from the resource supplied to the urban dwellers, which is the service rendered by FCT WB and it only applies to only areas/districts with water reticulation. Thus to enhance this process, "there are pipeline monitoring units in each Area Office that monitor the pipe networks to detect such problems as burst pipelines and leakages to put in replacement or repairs where needed and to ensure the pipelines are not tampered. The residents are also encouraged to report such if the monitoring teams have not reached such areas or identified such problems" (3rd Respondent).

It was repeatedly indicated that by virtue of handing over the operations and management of the potable water supply to the FCT WB they are in charge of monitoring the infrastructure, from both FCDA ESD and FHA respondents; however there are instances of joint monitoring as captured from further responses on the issue. For example, **"**FCDA ESD [by its mandate as the infrastructural developer or implementer in the FCC] assist FCT WB to monitor because they do not have the capacity [which is the technical manpower]" (14th Respondent). Another contribution is "my thinking is monitoring of the water infrastructure should be purely by FCT WB since they are the custodian of the operations and management' (18th Respondent).

[Nevertheless,] "there is a memorandum of understanding between FHA and the FCT WB on carrying out maintenance of the water infrastructure in the estates developed by the FHA. Thus, since FCT WB takes custody of the finished infrastructure for water in the city then the security and functionality of the facility should be their core mandate" (8th Respondent).
Another point that came out on this monitoring issue from the FHA is that, "[…] some areas not designated for housing have been encroached upon and this is the basis for such monitoring to address such misnomer while FCT WB solely monitors the water infrastructure" (6th Respondent). This infers some kind of joint monitoring by the FCT WB and the FHA in some peculiar areas of the city but with each minding their policy-oriented function. And a concluding comment on any form of joint-monitoring was, "the essence of handling over to FCT WB is because since they are the ones operating the water systems it is their statutory schedule to monitor and manage them, [which] should not concern us in FCDA" (15th Respondent).

B. Beneficiaries Participation

In the interviews this aspect was directed solely to key informants in FCT WB being the agency that deals directly with the customers on water reticulation issues as well as billing to collect revenue on the service delivery. Sometimes the Water Board deal directly with customers in cases of linking a house to the supply line such as, "[…] in most cases the connection is not made to individual customers until they come to seek permission for house connections. From that point, the person has become a customer and the data is captured, processing [sic] for the connection to be made" (4th Respondent).

Remarkably, the interviews with the residents revealed that the FCT WB is the only recognised actor group in terms of water reticulation in Abuja. This is not far-fetched since it is the staffs of the Water Board that distribute the bills, check the meters in the houses and are called upon whenever there are issues of leakages and/or burst pipes. Again, the customers on receiving their bills pay the rate into the FCT WB account at designated banks. In essence, the beneficiaries see FCT Water Board as the only custodian of water reticulation to their houses and have no idea of the functions of FCDA ESD or even the FHA in this regard.

The participation of beneficiaries seem to be quite poor such that, "the only way that residents assist in the area of operation is by reporting problems in the distribution lines e.g. leakage and this helps the Water Board to fix the problems and curtail leakages" (2nd Respondent). Also, "the only way our customers participate in the agency's activities is to report to us any problems like leakages or burst pipes for us to fix them in good time. Beyond that there is no other participation from customers. […] Beyond reporting such incidence, there is a management reporting forum for customers to find out if the service is satisfactory or if there is need for improvement. Again, there is no other participation from residents/beneficiaries and they are not responsible to pay for any maintenance on the pipelines except in their homes" (3rd Respondent). This was earlier stated by the 1st Respondent from the FCT WB.

A positive outlook on beneficiaries' participation from the 1st Respondent is that the FCT WB [sometimes] educate the customers (aka beneficiaries) to always report problems [such as burst pipes and leakages] so that they can be repaired within 24hours, especially if no monitoring team from the Water Board had identified the problem. He emphasized that,"[…] customers/residents do not participate in service delivery but we crave their indulgence and implore them to promptly report any leakage, water wasting or illegal tampering with the lines to us".

The customer reporting system used to be organised in such a way that beyond burst and leaking pipes, which is reported either to the field staffs or customer care units, the customers from one district to the other can meet with the management team. Hence, the comment, "[…] there used to be organized customer forum from district to district whereby customers were invited through the media and by flyers to come and make their complaints to the agency so that solutions are proffered for their concerns" (4th Respondent). However, this has been stifled by paucity of funds.

4.2.5 Summarized Findings on the Independent Variable

The summary of the findings on the independent variable of the conceptual framework disclose that the management approach of FCT WB is severely lacking at the tactical level in terms of poor and insufficient funding; poor steering roles; constrained information sharing; fragmented co-actors activities; limited networks that excludes the private sector and the inability to influence the infrastructural developer of the FCC (i.e. FCDA ESD) to expand the water facilities to areas yet to be reticulated with water supply. These underperformances amid others verify and are practically what Goldface-Irokalibe (2009) and Ajai (2012) respectively observed as the challenges of potable water service management in Nigeria.

4.3 Results on the Development of Potable Water Reticulations in Abuja City

The 'development of potable water reticulations in Abuja city' is the dependent variable in this study and the causality consequent from the management influence of the FCT WB. The data from the fieldwork were analysed by first demarcating the information on areas with potable water reticulations from others without before addressing the operationalized variables as in Chapter 2 of this thesis.

4.3.1 Areas in Abuja with Water Reticulations

From all the interviews conducted and even from observations it is quite obvious that not all districts or areas in Abuja have potable water reticulations. Though the city has a Water Supply Master Plan (as revealed by FCDA ESD personnel) the spatial distribution is yet to reach all existing residential areas while housing facilities are habitually being developed to address accommodation problems for the teeming crowd that migrate regularly into the city for better livelihood. The city areas that have been reticulated by FCDA following the Water Supply Master Plan are "[…] Garki, Wuse 1, Wuse 2, Maitama, Asokoro, Asokoro South Extension, Guzape areas, Gudu, Utako and Wuye" (13th Respondent).

The area sampled for this study is Kado estate located within Gwarinpa district, the district selected for this research purpose. For optimum operations, FCT WB established two area offices in Gwarinpa district. One is the Jabi Office that covers in its operations "Jabi, Utako, Life Camp, parts of Mabushi as well as Kado estate" (3rd and 5th Respondents), these are categorized as Gwarinpa 1. The second area office is in Gwarinpa estate, the name of this estate is what gave rise to the district name, and being a very large facility is categorized as Gwarinpa 2. Both Gwarinpa 1 and Gwarinpa 2 are in Gwarinpa district. Since Jabi Area Office has the custody of managing the potable water reticulations to Kado estate hence more information on the status of the service delivery was gathered from here including a map on the layout of the areas managed by the office. The findings from the office is that Jabi, Utako, Life Camp, parts of Mabushi and Kado estate are sufficiently reticulated with potable water supply.

A

Source: http://r.search.yahoo.com/_ylt=A2KLj.uN9bBXw…

B

Source: Fieldwork, 2016

C

Source: Fieldwork, 2016

D

Source: Fieldwork, 2016

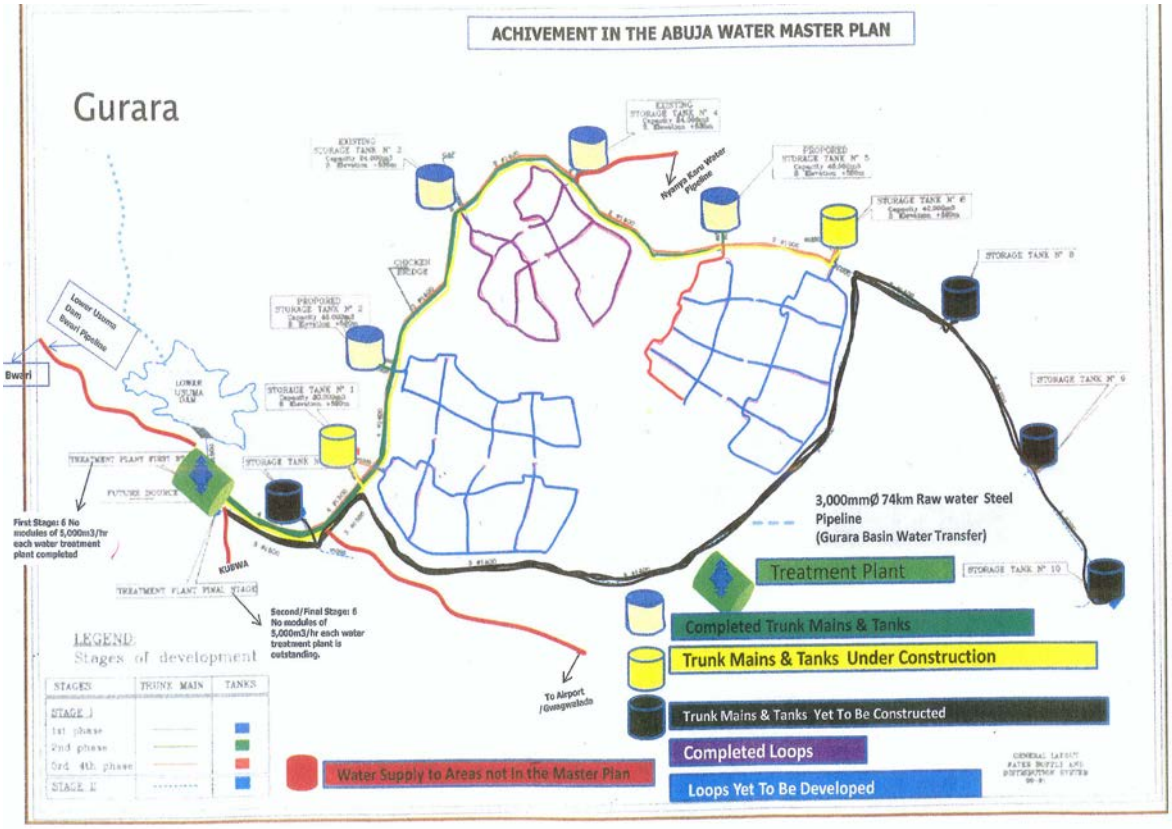
Pictures 4.1 Areas in and around Kado estate, Gwarinpa district, Abuja.

The above pictures (going from A to D) show the types of houses in the study area (both bungalows and duplexes in Kado estate) and the giant storage tank on a hill that supplies the estate with water by gravity.

A. Accessibility to the Supply

In Kado estate, the residents interviewed affirmed that the municipal water supply from the FCT WB was the most or even the only accessible source for domestic purposes. The interviewees, made up of three females and two males, are all adults having lived variedly in the estate for at least 6years and 20years at most. The municipal supply is reckoned as the most accessible by the comment, "the most available source of water in the neighbourhood is the supply from the Water Board. The distribution is fair and to my knowledge all houses have the supply. The supply is constantly available unless during maintenance or if problems occur" (19th Respondent).

Although a couple of my interviewees said they had private boreholes (in case of water shortage) but these are not in use because of how available the municipal source of water is in the area. The ready availability of this service delivery was not the case previously noting the comment of the 11th Respondent, which is, "we came in 1995 [and] starting having water in 2000".



Source: FCDA Engineering Services Department, Abuja (2016)

Figure 4.4: Layout of Achievement in Abuja WSMP

Figure 4.4 depicts the extent of water infrastructure installed in Abuja FCC from Gurara - Usuma, the dam that supplies the Lower Usuma Basin (see chapter 1, pg. 2), to reticulate the city with water. For the primary infrastructure the green coloured items are completed; the yellow under construction while the black are yet to be constructed. For the secondary infrastructure the purple items are completed, the blue are to be developed while the red are areas not in the master plan to be supplied with water.

B. Reliability of the Supply

The water delivery by FCT WB from the findings of the fieldwork is very reliable. According to the 12th Respondent, "the water is very regular, I will rate it as over 90%, except there is a major problem. There was a time there was a problem with the dam which made the supply stop but it was quickly rectified". The interviewees confirm they drink the water supplied by the municipal system except for the 7th and 12th Respondents who said they take bottled water for safety purpose. The 12th Respondent categorically said they react to pipe-borne water in her household. Further, the reliability of the water supply is justified by those who have boreholes stating that they have had no cause to use this private intervention. And the boreholes probably were developed when the estate was yet to be reticulated with the municipal source, which is prior to year 2000.

The 20th Respondent stated that her house was disconnected from the municipal supply since about 2014 over having separate meter from the next neighbour but they rely on the service through another neighbour. Her comment is, 'the source we get from is a neighbour's outside

tap, which is [from] Water Board, just about 10 steps from our house and whenever I come out to fetch the tap flows" (20th Respondent).

On the professional end, FCDA prides itself on crafting world standard pipelines with the comment, "[…] the areas we do by ourselves [sic] the quality is assured, the quality of FCDA job is comparable to any standard job in the world" (13th Respondent). This is a comparison between the works of FCDA ESD and that of FHA, even though the latter just concentrates in her estate facilities. However, the issue is that whether constructed by FCDA or FHA, it is one source supplying all the reticulations and with high pressure, which is reputed to damage any substandard piping in the water network leading to leakages and wastages.

On quality and quantity of the supply from the residents, a comment was, "the water is quite good, drinkable, there is no problem […]" (11th Respondent) and another was, "the quality is good but not excellent and the quantity is maximal" (19th Respondent).

C. Rating the Service Delivery

In an ideal situation, every social servicing agency or organisation should be rated regularly on the delivery or the impact by the people being served or benefiting from the service. This is a way of determining how well or poor the service is and should be a guide to either sustain or improve the service or even devise alternative approach to providing the service. Consequently, since the interviewees that are residents are beneficiaries of water reticulation, it became necessary to convey how they rate the operations of the FCT WB.

According to the 12th Respondent, "the service delivery is good however there is always need for improvement so they can improve to serve other areas that their service has not reached. […] The billing system has faults, when bills are paid they do not reconcile their accounts on time which leads to customers going to their main office to reconcile bills paid so avoid being disconnected for nothing".

Another though rated it well but had a negative comment as follows: - "The service delivery is fine but the only snag is that sometime they did not deliver their bills on time" (11th Respondent);
Further negative comment on how repairs are effected by the FCT WB was, "usually it is the residents that go to inform Water Board of such problems before they are fixed hence I do not consider their response to be good enough. […] I will rate their service delivery to be about 80%" (19th Respondent).

And a tip on safely accessing the water was, "I think the service is good. The water is clean and it is always flowing. We drink directly from the tap so the water is of good quality but if you don't fetch more regularly the tendency is that the first flow will be slightly coloured water and you need to allow the tap flush out for some time to get clear water" (20th Respondent).

Again, concerning being disconnected from the service the 20th Respondent concluded that, "the only problem so far experienced is that they should be consistent with the teams that go to the customers for billing and monitoring. Like I earlier said for about two years now we have not had water in the house because of this inconsistency and as much as we tried to resolve it, the issue has persisted. I desire that this be addressed so that their service will be better for us".

For the professionals, one of the comments was, "One cannot say we have attained 100% implementation of water reticulation" (3rd Respondent), confirming a kind of shortage in spread. Another depicted the poor performance so far as, "By and large as far as the Water Master Plan is concerned the progress is still below 40%, not even 30%" (15th Respondent).

While another posited more progress as, "in terms of water reticulation I cannot state that it is 100% but I know we have achieved maximally the potable water reticulation in Gwarinpa district" (17th Respondent).

A professional verified the insufficiency in reticulation by, "actually, the surrounding satellite towns do not have water reticulation […] including Lugbe district" (5th Respondent). This was confirmed by a resident whose father dwells in Kado estate (hence he was captured) but stays elsewhere with the comments, "[…] in Apo area where I stay the houses are all depending on private boreholes [as well as] Lokogoma axis, Lugbe […]" (7th Respondent).

Another expression of the service delivery by FCT WB in Gwarinpa district that is reticulated but the estate by which it is named is insufficiently reticulated is, "Gwarinpa is so big, it is about the biggest estate in West Africa or even in Africa, most of its areas are not reticulated (13th Respondent)".

4.3.2 Non-Reticulated Areas in Abuja

The findings from the field data revealed a lot of information on the non-reticulated areas in Abuja and issues pertaining to the situation, though it was not captured in the operationalization of concepts and variables for this study. The issues have to do with why there is insufficiency and what can be done to address the insufficiency.

Many districts, especially those not captured in the original three-phased development master plan for the FCC (Figure 4.3), are lacking potable water reticulation from the municipal source. Some, like Lugbe district, are equipped with internal (secondary and tertiary) infrastructural reticulation and are awaiting connection to the primary reticulation from the LUD. Also, many housing estates developed by the private sector have similar challenges of being in areas without the infrastructure (captured as red on Figure 4.5) and so depend solely on alternative interventions like private boreholes, wells or local water vendors.

A pointer to the obvious state of water reticulation in Lugbe area was, "there is no Area Office in Lugbe District because we have no infrastructure there and you cannot put an office in areas where there is no service to be rendered and revenue to be collected" (3rd Respondent).

Confirming that policy mandates empower agencies to function was the comment, "FCDA is the landlord that develops the FCT and if the landlord has not put in structure then there is nothing FHA can do in terms of infrastructure for Lugbe District that lacks water reticulation" (4th Respondent). Apart from Lugbe district other areas in the FCT equally lack water reticulation corroborated by, "[…] Dutse Alhaji will query why they don't have the public water service when the main pipes pass through their area to the city? […] Apart from Lugbe District there are other areas without water distribution like Dutse Alhaji I earlier mentioned" (4th Respondent).

However, the state of some yet to be reticulated area seem to be quite dire based on the statement, "[…] Lugbe has serious water issue and most residents there access water through Local water vendors popularly called mai ruwa which is not hygienic and the few that have sunk private boreholes experience them going dry after the rainy season." (6th Respondent). A further confirmation of above was, "I have a property or a house in Lugbe and it is not serviced by FCT Water Board, in short there is no such service there. Most houses have private boreholes which get dry during the dry season" (11th Respondent).

Another information that was substantiated by secondary data and observation during the fieldwork was the insufficiency even within Gwarinpa district with the statements, "most areas in Gwarinpa are being serviced by boreholes […] Gwarinpa is so big, it about the biggest estate in West Africa or even in Africa, most of its areas are not reticulated. [And a further contribution on Lugbe being] a pathetic case because it was not part of the city's development, it is outside the area of the FCC" (13th Respondent).

In confidence, one of the professionals (15th Respondent) during the interview blamed the insufficiency in potable water reticulations on political meddlesomeness stating that granting FHA rights to build an estate in a place like Lugbe without municipal infrastructure was fundamentally wrong. He then suggested that in such a case FHA should endeavour to provide an alternative water source. This case depicts how political leadership sometimes exert top-down irrational approach to policy matters regardless of the consequence of such actions.

A. Reasons for Insufficiency

Many governmental developmental goals seem to always have one setback or the other due to multifarious issues that many at times can just be said to be mismanagement of the processes, this is deduced from the comments extracted from the interviews on the reasons for insufficient reticulation in the FCC.

The first finding on this issue is that "Lugbe is a major problem area altogether, the water table is very low and the yield is also small" (1st Respondent). The fact that the blooming population, being a social factor, was added challenge is corroborated by, "Government is trying in terms of providing water supply to the city but the population of Abuja keeps on increasing because people are looking for greener pasture. Few years ago it was reckoned that in Africa it is only Abuja that is the capital where construction is still taking place" (2nd Respondent).

The multiplicity of the situation is profoundly emphasized by, "there are lot of factors that have led to this no water reticulation to some parts of Abuja including Lugbe, first of all the breaching of the Abuja Water Supply Master Plan is the first problem. Secondly, Abuja population was projected to be about 1.45m but now the rapid population growth has led to stress on the facilities. So there is serious problem in the water sector. Actually now the water supply is not adequate because of the teeming population into the city. […] At the end of the day, insufficient fund is the greatest challenge to having sufficient reticulation" (10th Respondent).

The issue of Lugbe having no water reticulation has persisted for almost 20years since the construction there of an estate facility by FHA according to the 8th Respondent. Since then "[…] Water Board is yet to establish their water mains [in that area]. […] The development of Abuja is in phases namely Phase 1, Phase 2, Phase 3, etc. and it is [being] done sequentially. You should not jump from Phase 1 to Phase 3 without first developing Phase 2, though this is not so practiced. And most of these private estates are in areas yet to have water reticulation from the public service hence the alternative of industrial boreholes" (3rd Respondent).

Another finding was the issue of how potable water is transported from the LUD, the source, to the urban dwellers being a sort of limitation for expanded reticulation. This came from the comments, "because the water distribution is by gravity so **e**xtension is limited and if there is

no infrastructure there cannot be extension services beyond where the water can go. Again, cost is another factor that hampers extension services; it will not be possible to just run water from Jabi to Lugbe estate because of the cost that will run into millions which most individuals cannot afford. […] Lugbe does not have water simply because FCDA has not put infrastructure to service the District" (4th Respondent).

Inappropriate allocation of districts or areas within the city that were not mapped for residences was another finding for non-reticulation of water to such areas with the comment, "[…] Dutse Alhaji [a settlement area beyond the FCC but within the FCT] on the original Master Plan is supposed to be a zoo hence it may be difficult to extend such services except it is reallocated as a residential district […]" (4th Respondent). This is another case of the meddlesomeness of the political class/leadership in urban management and development.

Generally, inadequate funding from the government to carry projects that expand infrastructure within development phases and from one to the next is responsible for such insufficiency, which was stated by the 5th Respondent as "[…] paucity of funds from the government has greatly hampered the effort to extend water reticulation to these areas […]".

The problem of water supply is said to be further constricted by the type of residents with the comments, "Lugbe has an additional problem because the occupants are more of low to medium income earners and have less purchasing power than those in Gwarinpa hence may not be able to drill private boreholes hence the dependence on the local water vendors [popularly called mai ruwa] according to the 6th Respondent. Who again complained of uncoordination in the water sector by commenting that "half of the problems in this matter is the lack of comprehensive planning, the water issue cannot be handled in isolation of other issues".
Apart from the government developing housing facilities through designated agencies like the FHA and a Unit within the FCDA, the private sector is actively involved in housing development in Abuja, which the 10th Respondent claimed had aggravated the problem because such developments are taking place in areas not planned for residential purpose or that have not been mapped for infrastructural installations.

A professional comment indicated that the plan for an alternative source of water supply is reason too for Lugbe lacking. This came from the 14th Respondent as, "…Abuja has a Water Master Plan, Lugbe cannot be supplied by the 'LUD' but there is plan for a dam to be constructed at Kuje which will supply Lugbe hence no water in Lugbe".

Another posited that co-actors in the water sector tend to be contentious rather than integrative with the comments,"I think one of the major problems we are facing is that one should be the change for the job to move. There is some form of contention in this regard - FCDA is saying they are the overall; FCT Water Board is saying that they are the ones on ground; though for our estates in FCT we always get land from FCTA – so that's the major issue. Actually, for a very long time there have been no project for FHA to handle in the FCT but I don't know why. This can be better explained by the management" (17th Respondent). This contradicts the basis for developing linkages that recognises the "multi-actor, multi-sectoral and multi-purpose affiliations of water management" (Tropp, 2007; Tortajada, 2010; Edelenbos et al., 2013).
Although the reticulation is grossly insufficient by the findings from the fieldwork there is yet no problem with the source of supply as revealed by the 18th Respondent that, "[…] we have sufficient water storage but there is a lot to do on reticulation in Abuja. In Phase 1, tanks 4

and 3 all the Loops have been completed but in others like Phase 2, 3 and 4 there is lots of work to be

B. Proffered Solutions for Insufficiency

From the data the solutions proffered for the prevailing insufficient reticulation in the city of Abuja range from ongoing programmes especially by the FCDA ESD to proposed programmes, some professional ideas as well as personal opinions. The diversity of the comments indicates the general desire for the municipal water supply to be accessible to all city dwellers.

One of the professionals proffered that "the government needs to do extension services but the concern is not to overstretch the existing infrastructure while planning for extension services." In addition, he stated that, "there should be awareness creation to enlighten the private developers on how viable the water sector in Abuja is in terms of investment. […] We value our water because of the cost and if we are not carried along by these developers it becomes difficult to establish adequate reticulation so that when secondary reticulation gets to their door they will be adequately connected to avoid wastages. There is therefore the need for a policy or circular that if any property is to be developed Water Board should be carried along. Also, in FCDA where the Department of Mass Housing partners with private developers there should be a circular to get them to also partner with FCT WB while doing the secondary reticulation" (2nd Respondent).

A defined solution was proffered by the 6th Respondent as "first of all there is a need for a comprehensive plan on how to handle the water issue in Phase 5 and this will lead to a slight redesign of the road because other infrastructures including water go along with the road network. There should be a reconnaissance survey of what is on ground, though the government is saying that there is paucity of funds in carrying out the daily activities not to talk of this suggested solution […]". This was suggestion was posited by 8th Respondent as well.

One of the residents believing that FCT WB is the infrastructural developer as well as the operator of water reticulation stated that they should endeavour to extend their services to other areas like Apo, Lokogoma axis and Lugbe since these areas are developing very fast to curb the accommodation problems in the city. He also noted that access to public water service is better and more cost-effective compared to having private boreholes.

Noting that there is fragmentation between actors in this sector, the 8th Respondent commented that "there is should be more cooperation between FHA and the FCT WB in this regard so that the case of Lugbe that is yet to be rectified will not be experienced again". In like mind, the 13th Respondent stated that "The only thing that will solve [the no water reticulation to housing estates] is if the contention between FCDA and FHA is overcome by liaising so that during their planning they will integrate with FCDA planners so that the structural plans of the city are integrated into their own property plans so that it is in tandem with the city's development pattern". Further similar response was "there is need for more collaboration with other partners, whether private developers or international bodies, in this regard. This will improve the network and create more services and opportunities in the water sector. […] Anyway, we are now constructing more transmission lines" (16th Respondent).

Considering that expanding the municipal mains to such areas may be long time coming a few respondents suggested the alternative of industrial boreholes especially for estate type

residential facilities. While the 17th Respondent stated that "since the government is developing Abuja in Phases, I am sure when development gets to that phase where Lugbe is there will be public water supply in those areas then".

From FCDA was following on how to address the challenge, "[…] In Phase 5 there is a contract ongoing now to give some areas water. […] Actually, Lugbe is not even part of the original Water Master Plan but with the recent expansion plan for the FCC it is in Phase 5. The old plan had to be redesigned to capture Lugbe. Gwarinpa is supposed to get water from Loop 1 Tank 1 that is not constructed yet. Though the trunk lines have been constructed but the Loop has not so it is receiving from Tank 2 Loop 2. This also affects Life Camp, the services here is just an extension form Tank 2 Loop 2. […] Actually, with some of the things that we have on ground now if we are able to go through with them then the insufficient reticulation being experienced now will be resolved" (18th Respondent). The respondent also stated that the federal government is in the process of signing an agreement with the Chinese government for soft loans to address several of the challenges being experienced in the water reticulation of the city

One of the residents seeing the issue in another light stated, "I will need them to improve on their distribution and circulation facilities. They should have alternative means of supplying the water in case the main line is broken or there is need for maintenance of the pipes. I think there should be other sophisticated methods to ensure that regardless of such maintenance the residents can still access water for use in the houses" (19th Respondent).

4.3.3 Summarized Findings on the Dependent Variable

The summation on this subject is that Abuja city is less than 40% reticulated with potable water though the areas with reticulation are having reliable service delivery. The means to expand water reticulation to the areas lacking the service is more an infrastructural shortfall than a lack of water supply and the mandate for further development of infrastructure lies with the FCDA ESD, not FCT WB. The findings are that more reticulation would have been achieved in the city by virtue of the Water Supply Master Plan but funding has been the greatest hindrance to achieving the necessary progress.

4.4 The Analysis on the Findings for the Study

The findings on the data as extracted from ATLAS.ti qualitative research process were further analysed taking cognisance of the conceptual framework developed for this study and the "features of governance for good water management" culled from Tropp (2007) in the literature review. These concepts guide explaining the influence of FCT WB management approach on the insufficiency in the development of potable water reticulations in Abuja City. An obvious finding from the data is that though FCT WB has the sole mandate to operate all water reticulations service in the city but the development of infrastructure for the service is majorly the mandate of FCDA ESD. While FHA, the national estates developer, install reticulations in their houses but resort to what is termed 'industrial boreholes' if there is no existing proximate primary pipeline to connect such estates to the public supply.

A. Strategic Level

At the 'strategic level' the management approach is found to be inhibited by fragmentation in the three respective actors pursuing diverse policy mandates even when their activities co-benefit the water sector. The totality of the matter is that FCDA ESD installs the major water infrastructures; FCT WB uses the infrastructure to supply potable water to Abuja city

residents as well as take charge of the management of FHA facilities that have been reticulated with water supply. Thus, FCT WB is seen to be just the operator of the infrastructure that FCDA ESD and FHA have respectively installed. The findings also indicate that FCT WB technical contribution to the development of water infrastructure is minimal, making the agency the least interactive in the process (Tropp, 2007) that leads to wider distribution of her service delivery**.**

Another element of inhibition at this level is the way decisions are taken for policy development and goals regardless of the joint-function of the three actors. The standard practice is that each group has a Board Committee as decision makers but the current administration since coming into power in 2015 had dissolved the Boards and is yet to constitute new Board Committees. In the absence of the Boards, the management team in each actor group propose decisions through the Permanent Secretaries of the Ministries to the Ministers, who tender the proposals before the Federal Executive Council meetings with the President for approvals. The drawback of this action is that the Ministers are political appointees and may not be professionals to successfully defend technical proposals for the desired presidential approval. On the other hand, a Board Committee as decision makers for an agency is team of the technical managers and political appointees. In the latter, decisions are more holistic because it incorporates professional knowledge while the ministers' can be more accommodating in decision-making, progress in dialogue, negotiations and networking (Tropp, 2007) because it is a forum for the administrative heads of the ministries to meet and rub minds. Notwithstanding, the ministers forum of networking is very much at the topmost level and opposes the vertical top-down hierarchy with horizontal levels of networking (Tropp, 2007) that the Board Committees provide.

B. Tactical Level

In line with the multi-level governance framework, at this level there should be active networking and joint-participation between FCT WB and the other actors, FCDA ESD and FHA. However, funding their activities was found to be so diverse with FCT WB depending on the national budgetary allocations even though it is a revenue generating agency and the funds released are just for maintenance purposes. FCDA ESD gets a statutory budget for their projects alongside the national budgetary allocations; the latter is for recurrent expenditure. FHA however, is not funded by the government but sources soft loans and mortgages to build estates which houses are sold to individuals; it is the profit from the sales that is used to run the agency. This diversity in funding is a cause for concern as the tendency is for each actor to maximise finances to meet respective policy goals, depicting fragmentation in activities.

Concerning partnerships and/or networks, FCT WB has a better collaborative mechanism with FCDA ESD than with FHA. A more robust situation would have been all three actors networking equally but from the field findings there seem to be none between FCDA ESD and FHA. However, the collaboration between FCT WB and FCDA ESD is made possible by FCDA ESD regularly involving the Water Board in all their water infrastructure projects because the Water Board will be and is responsible for the operations. This collaboration is enhanced by the frequent information sharing from FCDA ESD to FCT WB but findings from FCDA reveal that the Water Board hardly shares information with them. This attitude of the FCT WB is a serious hindrance to networks and hampers "progress in dialogue" advocated by Tropp (2007) as well as progress in coordination.

The partnership between FCT WB and FHA is based on a memorandum of understanding that empowers FCT WB to connect their estate facility to a proximate municipal main line, in most cases the primary reticulation, and thereafter takes charge of the water reticulation

services. This is only possible if FCDA ESD has installed water infrastructure in such vicinity otherwise there is nothing FCT WB can do and then FHA will have to provide industrial boreholes for such estates.

Beyond these regular networks, FCT WB has other forms of collaboration, especially with International Donor Agencies like JICA, AfDB and the World Bank, to enhance her operations and reduce wastages along the supply lines. These collaborations are intermittent and sometimes come in as soft loans or technical skills. An obvious omission is that the private sector is practically excluded and merely engaged for contract purposes. The above summation means that there is no "action-oriented common good that addresses problems at all scales, levels and domains" (Tropp, 2007) of the water reticulation operations.

C. Operational Level

From the findings the development of water infrastructure (i.e. the pipelines) is seen to be of three types namely primary, secondary and tertiary reticulations. FCDA ESD installs the primary and secondary while FHA does some secondary and tertiary reticulations within their estate facilities and FCT WB only handles tertiary reticulation, which is connecting individual houses to the secondary lines and installing each house with a meter. In this case it seems like there is division of responsibilities but in essence it is fragmentation of activities because each government agency if focused on specifics instead working together. Moreover, the management and operations of the water supply by FCT WB does not exclude FCDA ESD or FHA from supportive roles like fixing problems that arise in the primary and secondary pipelines. This is because FCT WB not being in charge of the installations has no professional skills to address problems in such pipelines. And can be said to assume a beggarly role in this regard as well as lacks the authority that is a very crucial element for such interventions" (Tropp, 2007).

D. Reflexive Level

The reflexive level of management emphasizes organizational networks and relationships for collaborative action (Tropp, 2007) however the findings is that the professionals in both FCDA ESD and FHA accept that FCT WB should have sole charge of managing the potable water infrastructure. FCT WB therefore in managing the infrastructure has monitoring units in each area office that go out on routine checks of the infrastructure to ensure there is no problem in the lines. For problems like burst or leakages in the tertiary reticulations the Water Board team can address but any problem in the primary and secondary reticulations will need the technical support of the FCDA ESD or if in the estates of the FHA. Such crisis leads to the actors jointly monitoring the lines to effect repairs. In essence, the water infrastructure are working faultlessly means FCT WB only handles the monitoring process that is the basis for their Area offices in allotted catchment areas of which Gwarinpa district is one. Gwarinpa district because of the size has two Area offices, the one at Jabi managing Utako, Jabi, Kado estate, Life Camp and parts of Mabushi categorized as Gwarinpa I. The second is in Gwarinpa estate categorized as Gwarinpa II, managing the estate and proximate areas to the estate.

E. The Service Delivery

The residents from the field data are beneficiaries of FCT WB service delivery and are termed customers by the agency since they are billed for the service monthly and should pay accordingly. Apart from paying the bills charged for the potable water utilized in respective houses the other form of participation that customers indulge in is to report any leakage or burst pipes to the Water Board to effect repairs. This was severally confirmed by the Water Board professional throughout the interviews. It was reported that previously the

management used to reach out to customers through regular forums held from one district to the other to hear out complaints and opinions for better service delivery but this has since been stopped for lack of funds. According to Tropp (2007), governance is frequently demonstrated in networks of public officers, private organisations, communities and citizens birthing the path for integrating informal institutions in policy matters. The informal institutions can be likened to this previously held customers' forum that has unfortunately been shelved by dearth of funds.

Findings from the professionals' interviews reveal the three government agencies as co-actors in the potable water reticulations process of Abuja but the findings from the beneficiaries indicate they are only aware of the FCT WB. This is so because all issues concerning potable water reticulations to end-users (whether of connection; payments; repairs; disconnection; penalties and reconnections) are always channelled to the Water Board. Hence, the potable water supply as a whole rated satisfactory is based on the people's perception that the service delivery is solely by FCT WB. And in this situation the perception is limited to their experiential awareness of the operations (Blatter and Blume, 2008) and excludes the technical supports provided by FCDA ESD and/or FHA, which is not known to the beneficiaries. Therefore, the beneficiaries' participation in the process, though minimal, is seen to occur at the "reflexive management level" of FCT WB.

The findings from the data summarily show that FCT WB within the confines of her policy mandate is sustainably operating and managing the reticulated areas within Abuja. Any effort to expand potable water reticulation to other areas of the city can only be achieved by a coordinated network with other technical partners, especially the FCDA ESD, at the tactical management level. This is typified by Figure 4.5 below.

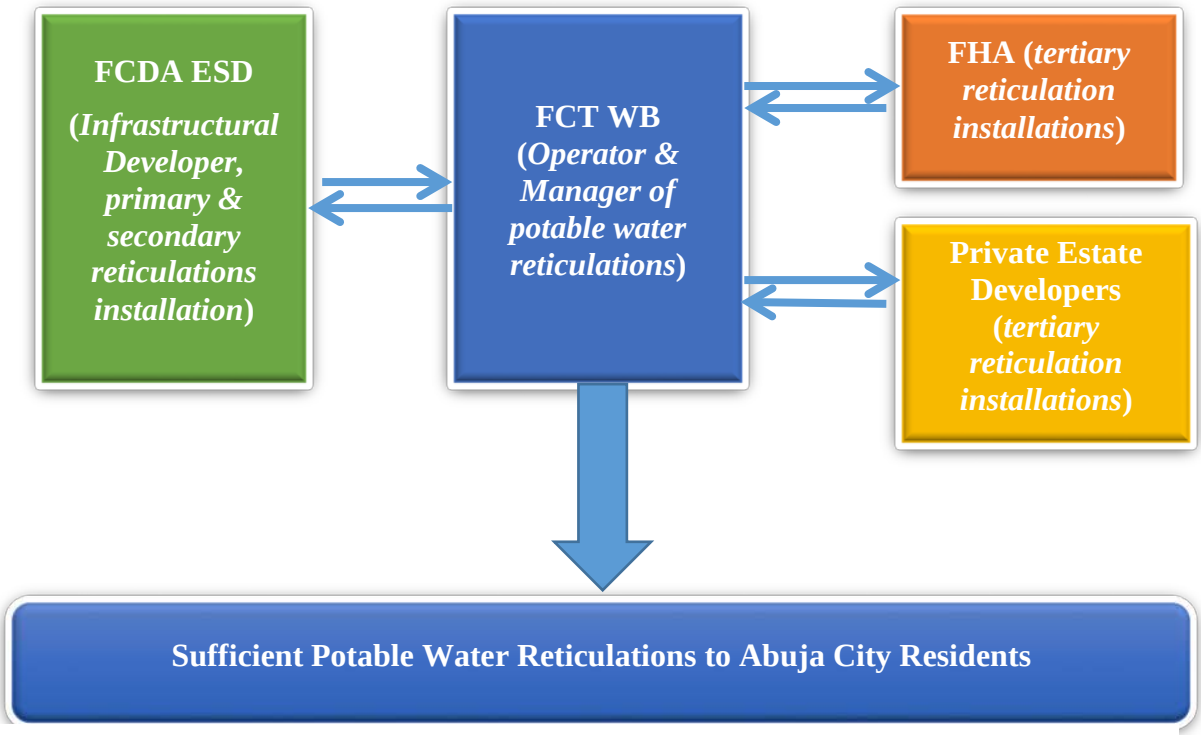


Figure 4.5: A Typology of Coordinated Potable Water Reticulations in Abuja City

Chapter 5: Conclusions and Recommendations

This thesis concludes with this chapter providing answers to the revised research questions posited in Chapter Three based on the findings from the fieldwork that were described in relation to the conceptual framework for the study and analysed on basis of the existing body of knowledge on good water management presented in Chapter Two. Also, the chapter reiterates the validity, suitability and significance of the study previously presented in Chapters One and Three as well as closes out with recommendations for a more coordinated management of the potable water reticulations in Abuja by the FCT WB.

The objective of this explanatory study is to present how the prevailing insufficiency in the development of potable water reticulations in Abuja (the Federal Capital City of Nigeria) has been influenced by the management approach of FCT WB. This was broadly drawn from the body of knowledge that the installation of potable water infrastructure and services in the city was majorly attained in phases from 1979 to about 1982 but beyond that period other improvements have been skeletal such that the prevailing situation is insufficient reticulation for the teeming population in the city. The focus of the study is urban water management for which the multi-level governance framework by Frantzeskaki & Tilie (2014) was adopted to provide appropriate answers to the research questions. Being an empirical situation, a case study strategy was selected to explain the influence of the independent variable (the management approach of FCT WB) on the causality at the dependent variable (development of potable water reticulations to the households in Abuja city).

5.1 Conclusions

Abuja is the Federal Capital City (FCC) of Nigeria; in view of making it one of the top modern cities of the world it has a development master plan and, particularly for this study, a Water Supply Master Plan (WSMP). These plans are respectively gazetted so that the course of development and improvements will be sustained by sequence of governments at both the federal and at the municipal level. However, we have a situation of the city development taking place in phases from 1 to 5 while the water supply development is being made to follow suit from district to district through the phases of the development. This following suit of water supply is seen to fall short due to a number of residential districts that have been observed to lack this service. The water supply in Abuja is a service delivered by the FCT Water Board (WB), the municipal agency responsible for the delivery. Hence, the thesis has been titled “Insufficient Potable Water Reticulation to Urban Households: The Case of Public Water Management in Abuja City, Nigeria”.

The need for research of this service delivery led to seeking to know if the management approach of the FCT WB has influenced the observed insufficiency or not and how it may have influenced it. The outcome of the research need is the conceptual framework that advances strategies in the management approach of the FCT WB that lead to the development of potable water reticulations to the households in Abuja city. On the basis of the households, Gwarinpa district was selected for the case study because it is fully developed straddling Phases 2 and 3 of the city’s development with residential estates established by the Federal Housing Authority (FHA), one of which is the sampled area for the in-depth interview of residents (Kado estate in Phase 2). Gwarinpa district is benchmarked against Lugbe district that has similar estate facilities developed by the FHA but is lacking public water supply.

The findings from the fieldwork reveal that though FCT WB is responsible for the service delivery as initially understood while there are other government agencies in the city involved in the infrastructural development of the potable water reticulations. These agencies

are the FCDA Engineering Services Department (ESD) and FHA. The FCDA ESD is a municipal agency like the FCT WB while FHA is a federal agency. The former handles the installation of amenities and infrastructures in the city like road networks, drainages, sewage lines, electricity including for water supply. The latter solely develops estate facilities for the residents in the city but ensure that these estates and the houses are equipped with infrastructure for internal water reticulation. The preceding discovery requires that there is coordinated network between the FCT WB and the other two agencies, which incidentally are her co-actors in the development of potable water reticulations to the city residents.

Correspondingly, the research questions posited at the beginning of this explanatory voyage will be answered by describing the level of governance from the framework by Frantzeskaki and Tilie (2014) that is relevant to the respective questions, which have been analysed by the features of governance for good water management culled from Tropp (2007) starting with the sub-questions.

a. What approach is being implemented by the FCT WB in the management of potable water reticulations to the urban households?

   Answer: The approach being implemented by the FCT WB in the management of potable water reticulations in Abuja city is basically strategic in terms of setting long-term goals, policy development processes, planning and creating vision to operate and manage the existing water infrastructure. This does not involve any co-actor participation because it is the policy mandate of the FCT WB.

b. To what extent has this approach involved other actors in the delivery of potable water supply to the households?

   Answer: The findings on the data from the fieldwork revealed that FCT WB is severely lacking in this regard at the tactical management level because of her poor steering role, fragmented co-actors activities, limited networks and constrained information sharing (Tropp, 2007). In addition, the role of installing major infrastructure for potable water reticulations is the mandate of the FCDA ESD and not FCT WB. It then requires that the FCT WB collaborate with FCDA ESD; the situation is that FCDA ESD is in charge and regularly engages FCT WB as part of the supervisory team in all projects pertaining to the installation of both primary and secondary reticulations in the city. On completion of such projects the FCT WB is given charge of the infrastructure to operate and manage in supplying water to the designated residents.

   However, with the FHA there is said to be a Memorandum of Understanding (MoU) between them and the FCT WB. The MoU empowers the FHA to install internal potable water reticulations in the estates and houses they construct. The role of connecting FHA estates to a proximate public water supply point is that of FCT WB as well as the latter operations and management of such estates, if connected.

   Another actor group identified as part of the problem of having more non-reticulated residential areas in Abuja but is not being collaborated with is private estate developers, who similarly construct housing estates like the FHA and most likely have similar arrangement with the FCT WB for connecting to the public supply but in a less formal way.

c. What strategies in the management approach explain the state of water reticulation in the city?

   Answer: The management strategies employed by the FCT WB that has led to the state of water reticulations in Abuja is best explained by the tactical level of the

governance framework. The findings from the data have revealed that FCT WB is not in control of the infrastructural development to improve or expand water reticulations in the city, hence lacks the steering role especially as the Water Supply Master Plan is in the custody of the FCDA ESD with the mandate to install the water infrastructure in all the districts of the FCC. The water reticulations scheme is further hampered by the top-down approach of series of government, inadequate funding or lack of funds, uncoordinated activities between FCT WB and the other relevant actors as well as poor information sharing between actors. Although FCDA ESD exhibited a high level of information sharing with FCT WB but the reverse is the case from the latter.

Following the preceding, the main question of "in what way does the management approach of FCT Water Board influence the development of potable water reticulations to urban households in the Federal Capital City (FCC), Abuja - Nigeria?", it is now understood that the management approach of FCT WB does not influence potable water reticulations in terms of the infrastructural development. And the infrastructural development is the basis for extending sufficient reticulations across Abuja. Consequently, FCT WB is unable to achieve sufficient reticulations in the city because the process requires the mutual participation of the FCDA ESD, FHA as well as the private sector. Thus, the management approach of FCT WB influences the potable water reticulations only to the extent the primary and secondary infrastructure have been provided or installed by FCDA ESD in the FCC. The outcome of this study is that the management approach of the FCT WB by itself influences just the operations and management of potable water supply in Abuja City, Nigeria.

5.2 Validity of the Study

The case study research strategy was selected on the basis that it is an experiential condition that with evidence will check the concept used in validating the empirical context (Blatter and Blume, 2008). The context here is Abuja, the capital city of Nigeria that has a development master plan as well as a WSMP. The focus on the management effects of the FCT WB on the causality of reticulation to the city dwellers is because it is recognized as the actor that regulates the water sector in Abuja.

The internal validity of the study was addressed with the in-depth interviews of key informants from the three respective government agencies identified as actors in the water sector, the cumulative responses gave credence to the empirical context of this study. The replication in information strengthens the validity of the study and conforms to the theory of Verschuren and Dooreward (2010). The information from the FCT WB on beneficiaries' participation was authenticated by interviewing the residents in Kado estate, one of the catchment areas benefiting from the service delivery. This is in line with backing up information with experiential conditions by Neuman (2006). The field exercise was supported by a transparent and true report of all the responses from both the professionals and residents recorded during the interview sessions. Also, the findings from the interviews also validated the empirical context that Lugbe district amongst other districts in Abuja is yet to be connected to the public water supply. This study confirms what Abubakar (2014) had indicated that in Abuja access to the public water service network by the inhabitants is not greater than 40% though the prevailing situation is given as less than 40%. The validity of this study is enhanced by the dense connectivity of the findings during the interviews from respective professionals within groups and across groups as well as from the residents.

5.3 Suitability of the Study

The suitability of the case study is enhanced by the adopted multi-level governance framework and aided by the use of semi-structured interview guides because some information was known of the empirical situation but more information was required to explain the causality on the dependent variable. The key informants were all participants in respective actor group including the residents that are beneficiaries of the service delivery in context. The interview guides were formulated to suit the respective groups and tested before administering them for the exercise. However, the case being a social context is usually not stable over time but the use of the multi-level governance framework focuses on the processes within the responsible government agency, which is a more stable content than the social context, hence can be replicated by other researchers to get similar findings.

5.4 Significance of the Study

The function of FCT WB is service delivery in the water sector, particularly to provide potable water in good quality and sufficient quantity to the city dwellers on a sustainable basis. The governance of urban services like potable water reticulations requires strategies that necessitate networks among relevant actors, whether in the public sector, private organisations, non-governmental organisations and even civil organisations for sustainable development of the service.

This study clearly presents the relational characteristic that co-actors should adopt in the course of service delivery as in this case of public water supply. Although as in many developing economies of the world, of which Nigeria is one, paucity of funds has been noted as a major barrier to achieving sufficiency in this process as well as fragmentation in co-actors activities. The study is significant to identify within a case scenario the causality for the shortfall in providing sufficient potable water reticulations to the city dwellers, a situation that has been mismanaged even though there is a statutory 'Water Supply Master Plan' for Abuja city.

The study provided detailed information on the interdependence of the relevant government agencies in the policy development of potable water reticulations in Abuja. The study is also significant because it has contributed to the existing body of knowledge that the multi-level governance framework can be used beyond urban ecosystem services by any level of government or service managers to establish adequate networks and improve service provision and delivery.

5.5 Recommendations

The policy pursuit of the FCT Water Board is to provide clean and safe potable water to all residents in Abuja on a sustainable basis as well as to generate as much revenue from the potable water supplied. It is a function being managed satisfactorily within the catchment areas but the further development is being hindered by several factors that include governments' top-down approach to policy issues, insufficient funding and the necessary involvement of other actors, especially the FCDA ESD. Further development of potable water reticulations in the city can be enhanced by empowering the FCT WB to steer the process. And for FCT WB to steer the process means having more coordinated networks with FCDA ESD as well as with FHA and the private sector, as typified by Figure 4.5 on page 45. The adoption of the multi-level governance framework, especially at the tactical level, is recommended for the FCT WB to better manage the network of actors involved in the potable water reticulations of Abuja city.

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Annex 1: Interview Guide for FCT Water Board

Research Topic: Management Influence on Potable Water Reticulation to Urban Households in Abuja by FCT Water Board, Nigeria.

Date:…….. Serial No……..

INTRODUCTION:

My name is **Donna O. Aimiuwu (Mrs.)**, a Masters student of Urban Management and Development at Erasmus University in the Netherlands. I am currently on field work for my research project and the topic is on public water management of potable water reticulation to urban households in Abuja, particularly in Gwarinpa District and in Lugbe District. The desire to interview you is borne on the fact that as a member of staff working in the organisation responsible for/actively involved in the water supply distribution, you are in a key position to provide information that can help me understand and appreciate the process. I humbly seek your permission to interview you, assuring you that the information provided will be treated with utmost confidentiality and used purely for academic purpose.

I need to accurately document the information being provided for collation and for appropriate analysis; this leads me to request your kind permission to record by electronic device the entire interview. Again, I assure you that the recording is purely for academic purpose and will be expunged after the analysis is concluded. In the light of the above, I hope we can carry on with the interview with your kind permissions.

INTERVIEW QUESTIONS

Topics	Interview Questions	Indicators
A. Formal Introduction	1. Please can I know more about you on the job? 2. What position do you hold in the office? 3. What roles are you responsible for on the job? 4. How long have you been in this position?	- Name of Agency/Organization - interviewee's position, role and duration of position in the organization
B. Strategic management level	5. The focus of this interview is on reticulation of potable water to the city dwellers, what is the aim of your agency/organisation in this regard? • In terms of goals, policy issues, plans, • Proposed developments or extensions	- Setting goals for water reticulation - Supporting policy development processes - Planning
C. Tactical management level	6. How would you describe the functions of your agency/organisation in the water reticulation process? 7. How are decisions made for the process? • Management Board • Head of Agency/responsible Unit • Team Work 8. What resources are available for the functions? • Through budget, Internal Generated Revenue, support funding from Int'l Bodies, etc. 9. What forms of collaboration does your agency/organisation have with other actors in the course of this process? Such as: - • FCTA • FHA, FCDA Engineering Dept., Infrastructure Developers, etc. • Biwater, JICA, etc. • Gwarinpa District residents 10. How is information shared or communicated within the agency/organisation? 11. How is such information extended to actors in collaboration on the process?	- Steering activities - Programmes - Funding - Collaborating with FCT Water Board

Topics	Interview Questions	Indicators
D. Operational management level	12. To what extent have your organisation implemented potable reticulation in the city? 13. How is the existing infrastructure being managed? 14. In managing the existing infrastructure is there is any form of participation from other actors involved in the process and/or benefiting city dwellers? 15. In what way are extension and/or expansion of infrastructure being implemented in the city? • To reach unreached areas of the city	- Supporting policy action plans, infrastructure plans and assets on water reticulation - Managing the policy action plans, infrastructure plans and assets
E. Reflexive management level	16. Concerning the implemented infrastructure, in what way does your agency/organization ensure functional, secured and regular water supplies to the beneficiaries? 17. How does your organisation conduct post-implementation evaluation on infrastructure? 18. What mechanisms are in place for the urban dwellers, both those benefiting and yet to benefit, to participate in service delivery?	- Monitoring implemented projects for social, economic and environmental impacts - Evaluating implemented projects on the basis of social, economic and environmental impacts
F. Closure	19. In essence, kindly tell me what in your opinion is the reason for some parts of the city not having pipe-borne water service? 20. Then how do you think this can be resolved?	- Limited reticulation of potable water supplies

CONCLUSION:
The above are the series of question prepared beforehand for this interview, seeing the content and course of my research please is there any other information that you think will further enhance my thesis? Or something you think I need to add? Also, would you want to ask me any question?

I really appreciate your sparing your time to receive me and support my research work with very helpful information, thank you. I may need to come back to you for more information or additional clarification, I hope you will not mind and as earlier stated the information given is purely for academic purpose and to enhance knowledge. Thank you again and enjoy the rest of your day.

Annex 2: Interview Guide for FCDA ESD and FHA

Research Topic: Management Influence on Potable Water Reticulation to Urban Households in Abuja by FCT Water Board, Nigeria.

Date:…….. Serial No……..

INTRODUCTION:

My name is **Donna O. Aimiuwu (Mrs.)**, a Master's student of Urban Management and Development at Erasmus University in the Netherlands. I am currently on field work for my research project and the topic is on public water management of potable water reticulation to urban households in Abuja, particularly in Gwarinpa District of the city. The desire to interview you is borne on the fact that as a member of staff working in the organisation responsible for/actively involved in the water supply distribution, you are in a key position to provide information that can help me understand and appreciate the process. I humbly seek your permission to interview you, assuring you that the information provided will be treated with utmost confidentiality and used purely for academic purpose.

I need to accurately document the information being provided for collation and for appropriate analysis; this leads me to request your kind permission to record by electronic device the entire interview. Again, I assure you that the recording is purely for academic purpose and will be expunged after the analysis is concluded. In the light of the above, I hope we can carry on with the interview with your kind permissions.

INTERVIEW QUESTIONS

Topics	Interview Questions	Indicators
A. Formal Introduction	1. Please can I know more of you on the job? 2. What position do you hold in the office? 3. What roles are you responsible for on the job? 4. How long have you been in this position?	- Name of Agency/Organization - interviewee's position, role and duration of position in the organization
B. Strategic management level	5. The focus of this interview is on reticulation of potable water to the city dwellers, what is the aim of your agency/organisation in this regard? • In terms of goals, policy issues, plans, etc. • Proposed developments or extensions	- Setting long-term goals - Policy development processes - Planning - Creating vision
C. Tactical management level	6. How would you describe the functions of your agency/organisation in the water reticulation process? 7. How are decisions made for the process? • Management Board • Head of Agency/responsible Unit • Team Work 8. What resources are available for the functions? • Through budget, support funding from Int'l Bodies, etc. 9. What forms of collaboration does your agency/organisation have FCT Water Board? 10. How does information from the FCT Water Board get shared or communicated to your agency/organisation?	- Steering activities - Programmes - Funding - Establishing networks and/or partnerships

Topics	Interview Questions	Indicators
D. Operational management level	11. To what extent have your organisation being involved with potable reticulation in the city? 12. How involved is your agency/organisation in monitoring the existing infrastructure? 13. In what way are extension and/or expansion of infrastructure being implemented in the city? • To reach unreached areas of the city	- Implementing policy action plans, infrastructure plans and assets - Managing policy action plans, infrastructure plans and assets
E. Reflexive management level	14. Concerning the implemented infrastructure, is your organisation in collaboration with the FCT Water Board to ensure functional, secured and regular water supplies to the beneficiaries? 15. Does your organisation in any way collaborate with FCT Water Board to conduct post-implementation evaluation on the water infrastructure?	- Monitoring implemented projects for social, economic and environmental impacts - Evaluating implemented projects on the basis of social, economic and environmental impacts
F. Closure	16. In essence, kindly tell me what in your opinion is the reason for some parts of the city not having pipe-borne water service? 17. Then how do you think this can be resolved?	- Limited reticulation of potable water supplies

CONCLUSION:

The above are the series of question prepared beforehand for this interview, seeing the content and course of my research please is there any other information that you think will further enhance my thesis? Or something you think I need to add? Also, would you want to ask me any question?

I really appreciate your sparing your time to receive me and support my research work with very helpful information, thank you. I may need to come back to you for more information or additional clarification, I hope you will not mind and as earlier stated the information given is purely for academic purpose and to enhance knowledge. Thank you again and enjoy the rest of your day.

Annex 3: Interview Guide for Gwarinpa District Residents

Research Topic: Management Influence on Potable Water Reticulation to Urban Households in Abuja by FCT Water Board, Nigeria.

Date:…….. Serial No……..

INTRODUCTION:
The researcher is **Donna Aimiuwu** (Mrs.), a Masters student of Urban Management and Development at Erasmus University Rotterdam in the Netherlands. The purpose of this interview is to collate information from the residents in Gwarinpa District on the prevailing state of pipe-borne water supply from FCT Water Board in the residential areas.

I need to accurately document the information being provided for collation and for appropriate analysis; this leads me to request your kind permission to record by electronic device the entire interview. I assure you that the recording is purely for academic purpose and will be expunged after the analysis is concluded. In the light of the above, I hope we can carry on with the interview with your kind permissions.

INTERVIEW QUESTIONS

Topics	Interview Questions	Indicators
A. Formal Introduction	1. Please can I more about you? 2. What is your address? 3. What is your age range? 4. What is your occupation? 5. How long have you been living in this area? 6. What type of house do you live in? 7. What is your occupancy status please?	- Name of Interviewee - Location in area - Less than18years, 18 to 60years or over 60years - Source of income - Years living in the area - Single rooms, Bungalow, Duplex, Apartments, etc. - Tenant, Owner, Official residence, Specify if any other…
B. Accessibility	8. What is the most available source of domestic water in your area? 9. What is the source of water accessed by your household for domestic purposes? 10. How well distributed is the municipal pipe-borne water in your area?	- Municipal Water Supply or other sources to be specified
C. Reliability	11. How regular is the supply of potable water from FCT Water Board to your house? 12. How do you rate the quality of the supplied water? 13. How do you rate the quantity of the water? 14. Do you experience problems or any form of shortfall in the water supply or infrastructure like pipe burst, leakages, etc.? 15. If there are problems how would you rate the response of FCT Water Board to fix such?	- Regularity - Quality supply - Sufficient quantity - Water problems, if any - Response to problems by the Supplier - Routine maintenance
D. Closure	16. Considering the supply of potable water by the FCT Water Board how would you rate the entire service delivery? 17. Is the service delivery up to your expectation or there is need for improvements? 18. If there is need for improvements, what way would you suggest it can be done?	- Acceptance of service or suggestions for improvement

CONCLUSION:
The above are the series of question prepared beforehand for this interview, seeing the content and course of my research please is there any other information that you think will further enhance my thesis? Or something you think I need to add? Also, would you want to ask me any question?

I really appreciate your sparing your time to receive me and support my research work with very helpful information, thank you. As stated earlier all information given here is purely for academic purpose and to enhance knowledge. Thank you and enjoy the rest of your day.

Annex 4: List of Respondents from the Study In-depth Interviews

Actor No.	Code	Organisation/ Residence	Gender	Position/ Occupation	Duration in Position/Area
1.	M_01FwbDO	Water Board	M	Area Manager	5years
2.	M_02FwbMA	Water Board	M	Assistant Area Manager	3years
3.	M_03FwbSM	Water Board	M	Assistant Area Manager	Some years
4.	M_04FwbJA	Water Board	M	Assistant Manager	5years
5.	M_05FwbSB	Water Board	M	Manager	2years
6.	M_01FhaAI	FHA	M	Head Town Planning	3years
7.	M_01GdrDG	Phase I	M	Business man	6years
8.	M_02FhaHS	FHA	M	Deputy General Manager	2years
9.	M_03FhaAB	FHA	M	Assistant General Manager	8months
10.	M_04FhaKA	FHA	M	Assistant Chief Mechanical Engineer	2years
11.	F_02GdrFE	Phase I	F	Retired civil servant now in business	20years
12.	F_03GdrFA	Phase I	F	Civil servant	20years
13.	M_01FcdOE	FCDA	M	Deputy Director	>1year
14.	M_02FcdSO	FCDA	M	Assistant Director	3years
15.	M_03FcdCU	FCDA	M	Assistant Director	2years
16.	M_04FcdMB	FCDA	M	Chief Resident Engineer	>1year
17.	M_05FhaJO	FHA	M	Assistant Chief Technical Officer	4years
18.	M_05FcdGL	FCDA	M	Chief Engineer	3years
19.	M_04GdrVO	Phase I	M	Student	17years
20.	F_05GdrVI	Phase II	F	Teacher	10years

Annex 5: Code-Filter for the Study (from ATLAS.ti)

HU: Water Reticulation data updated 4th August
File: [C:\Users\FMENV(EA)\Documents\Scientific Softwa...\Water Reticulation data updated 4th August.hpr7]
Edited by: Super
Date/Time: 2016-08-11 21:23:42

Accessibility to municipal supply
Areas without reticulation
Beneficiaries' background
Beneficiaries' participation
Co-actors joint-activities
Decision making
Funding for activities
Implementation process
Information sharing
Monitoring process
Operational process
Other collaborations
Policy goals
Professional background
Rating service delivery
Reasons for insufficient reticulation
Reliability of municipal supply
Reticulated areas in FCT
Suggested solutions to insufficiency

Annex 6: Study Data Overview from ATLAS.ti Analysis

S/N	Families	Codes	No. of Identified Quotations
1.	Backgrounds	a. Professional b. Beneficiaries'	a. 15 b. 5
2.	Strategic Management Level	a. Policy goals b. Decision making	a. 14 b. 12
3.	Tactical Management Level	a. Funding for activities b. Actors joint-activities c. Information sharing d. Other forms of collaboration	a. 20 b. 45 c. 10 d. 31
4.	Operational Management Level	a. Implementation process b. Operational process	a. 35 b. 24
5.	Reflexive Management Level	a. Monitoring process b. Beneficiaries' participation	a. 12 b. 10
6.	Areas with water reticulation	a. Accessibility to the supply b. Reliability of the supply c. Rating the service delivery	a. 5 b. 7 c. 9
7.	Non-reticulated areas	a. Reasons for insufficiency b. Proffered solutions for insufficiency	a. 51 b. 18

Annex 7: IHS copyright form

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