

URBANIZATION TREND AND WATER INSECURITY IN DEVELOPING ECONOMY MEGA-CITY: A CASE STUDY OF LAGOS, NIGERIA

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ABSTRACT

This study traces the urbanization trend of a developing economy mega-city and relates it to its water insecurity. It identifies the importance of water security to human, environmental and state security. The research establishes the inadequacy of portable water in the developing economic mega-city, which makes residents to source for alternatives. It recognizes the implications of water insecurity on the health conditions of the residents. It posited that shortage of portable water supply would invariably have more economic implications on the poor and down trodden in the developing economic mega-city. The paper identifies that the Lagos mega-city water security concept tends towards sectorial management of water resources as compared to the developmental concept of Integrated Water Resource Management (IWRM) or the Integrated Urban Water Resource Management (IUWRM).

Keywords: Urbanization, Mega-city, Water Insecurity, Water Security, Developing Economy, Portable Water.

INTRODUCTION

Urbanization has continued to be a major focus of researchers since last century. This is because researchers are admittedly realizing its merits and demerits thereby looking for acceptable methodologies of ameliorating the unfavorable conditions associated with rapid urbanizations in different parts of the world.

The word urbanization connotes different things to researchers and policy makers in different parts of the world leaving it at present with an unidentifiable definition. This unidentifiable definition allows each researchers and policy makers to make do with the definitions that suite their cases. This may also be due to the fact that the word 'urban' where urbanization stems out is dependent on the perception of each nation (United Nations, 2005). Thus, every nation or countries have their own way of determining and classifying urbanization, urban centers/regions and cities. Zhu (1999) defined urbanization with the understanding of the United Nations given attributes of urban setting as

[...] consist of at least four components: first, the definition of urban areas, second, the growth of population of these urban areas which is generally caused by rural-urban migration, natural increase and reclassification; thirdly, an increase in numbers of people engaged in non-agricultural activities; finally, the distinctive environment and organization of cities which enable urban ways of life.

Urbanization could be looked at as increasing numbers of settlements showing the characteristics of cities by population size or density through rural-urban migration and or through internal population growth or migration between urban areas (WaterAid, 2006). This might have been due to the continuous growth of cities and urban areas as compared to their rural counterparts around the world. This makes urbanization debate at most times to focus on cities that are larger than many countries (Haub, 2009). Therefore population discourses in the world falls into the urbanization discourses and vice versa.

The concept of mega-city, which evolved towards the end of the 20th century, identifies and discusses cities that are larger than many countries. Mega-city is always defined as a city or urban center having population that is above 5 million people and 10 million people (Varis, Biswas, Tortajada & Lundqvist, 2006; Planetearth 2005; Klein, Nicholls & Thomalla, 2003; Gubry & Huong 2002). The mega-city acceptable definition now tends towards aligning with the definition of city with a population that is above 10 million inhabitants than that of 5 million inhabitants. The urbanization trends are now viewed to pose serious problems to ecosystem and human well being due to lack of understanding and appreciation of the complex processes involved (McGranahan, Marcotullio, Bai et al, 2005).

Urbanization discourse is inclined towards population discourse when talking about cities, the tend is the usual consideration of population growth as the determinant of urbanization. Therefore policy makers and urban researchers worldwide are searching for appropriate solution to urban growth associated problems especially when it might have been exacerbated by population growth. Hinrichsen and Robey (2000) in the article titled *Population and environment: the global challenge* reasoned that population growth can lessen (deplete) the quality of life because it destroys resources, such as water and forest that is needed for sustenance and slows the dynamics of the healthy economy and decrease the biodiversity. It is on this note that this study determines the water insecurity components of the developing economy mega-city as an important key in achieving sustainable development. This study shall be divided into sections. The sections include the concept of security, human security and environmental security as an introductory aspect to the concept of water security. It will also examine the water security of developing economy mega-city using Lagos as a case study. Study will conclude and bring out appropriate recommendation for sustainable water security in developing economy mega-city.

CONCEPT OF SECURITY

Water security discourse is essentially viewed as one of the current security debate. This section will therefore discuss the concept of security as foundation to water security. The concept of security was always looked at as concerning the threat to the integrity of the state especially with experiences of wars and conflicts in different parts of the world. Every nation or state tends to protect itself from external threat or aggression by strengthening its own security. This notion of security was becoming an acceptable norm in every society and also became referenced by most nations or states with their procurement and/or production of armaments to protect their territories. Therefore, the security of states or the traditional security is always given high priority and recognition in nearly all nation states with all other forms of security facing unnecessary neglects and not given recognition.

Researchers lately identified other forms of security that were neglected by the states in a bid of achieving total human security. Among the new identified forms of security is the environmental security. This new concept of security emphasizes ecological and environmental sustainability in order to achieve human security. The concept tends to look at the ecological conditions in relationship to human as a process of achieving sustainable development. Water security is a component of environmental and human security concepts.

This current debate is essential in promoting the tenets of sustainable development as prescribed by the Brundtland Commission of the World Commission on Environment and Development in 1987 in its definition of sustainable development. Brundtland proclaimed sustainable development as a “development that meets the needs of the present without compromising the needs of the future generations to meet their own needs (World Commission on Environment and Development, 1987). The underlying focus of principles of sustainable development is the sustainability of our environment, which is an integral way of achieving peace, security and socio-economic development.

The Concept of Human Security and Environmental Security

The concepts, human security and environmental security are interwoven and interconnected to the extent that environmental security can be assumed to stem out of human security while human security could also be seen to have branched out of environmental security. This is because the goals of the two concepts intertwine and align towards achieving sustainable development.

Human security focuses on the everyday security as experienced by individuals around the world (Svenson, 2007). It takes a “comprehensive view of all threats to human survival, life and dignity, and stresses the need to respond to such threats” (Neethling, 2005). Human security is by far different from the traditional security that focuses on only the threat to the state. In the article titled *Human Security as Inclusive Security –Gender, Epistemology and Equality* by Svenson (2007), the components of human security were highlighted in accordance with 1994 UNDP reports as economic security, food security, environmental security, personal security, community security, and political security.

The concept of environmental security is within the concept of human security. Environmental security is a new developmental concept like the human security. It focuses on the sustainability of the world ecology. Since it is a recently evolving concept, it has varied definitions but all tends towards ecological sustainability. Environmental security could be defined as “implications of environmental degradation, scarcity and stress due to disasters, migration, crises, and conflicts and on the resolution, prevention and avoidance of environmental damage” (Kreimer, Arnold & Carlin, 2003). It could also be defined as “issues from energy security and climate security, to water and health security (Steiner, 2006). From these definitions we could deduce that environmental security looks at the protection of individual with the view of complementing the human security.

The two concepts, human and environmental securities are to drive the society towards sustainability thereby becoming veritable instruments in achieving sustainable development. The concept of human and environmental security hinges on water security for its survival and sustainability because of the importance of water to the sustenance of life.

The Concept of Water Security

Water security is a developmental concept that identifies the water dynamics of a particular area and provides an appropriate methodology for its remedy. The concept is essential to human and society because of water importance to life. Water security as a new developmental concept is evolving in definitions. It is an anchor part of the environmental security because it inter-relates with every other parts of human security thereby becoming a veritable instrument for sustainable development.

Water security involves “the sustainable use and protection of water systems, the protection against water related hazards (floods and droughts), the sustainable development of water resources and the safeguarding of (access to) water functions and services for humans and the environment” (Schultz & Uhlenbrooks, 2007). The UNESCO-IHE (undated) Institute for water education posited, “water security involves protection of vulnerable water systems, protection against water related hazards, such as floods, drought, sustainable development of water resources and safeguarding to water functions and services”. The institute further reiterated that intervening in water systems is essential in order to meet the needs of society and also to face the challenges of all kinds of global changes (e.g. climate change, land use etc).

The water security discourse is thereby a necessary debate because of its impact on urban areas and cities. This is because water security aspects of the society tend to have its own toil from the trends of urbanization worldwide.

The study aligns with the definition of water security given by Global Water Partnership (2000) which posits that at any level from the household to the global, every person needs to have access to enough safe water at affordable cost which encourages living clean, healthy and productive life. Therefore, this paper builds on this position by focusing on the potable and domestic water supply aspect of water security. It relates this aspect of water security to the urbanization trends that is being witnessed in different parts of the world with emphasis on the developing economy mega-city Lagos of Nigeria.

NIGERIA’S URBANIZATION TRENDS

This section examines Nigeria’s urbanization trends. It has been inferred that virtually the entire population growth in the world during the coming decades will occur in, or will be concentrated to urban agglomeration in the developing countries (Brockhoff, 2000, in Lundqvist, Appasamy & Nellyat, 2003). According to Brockhoff, (cited in Lundqvist et al. 2003) “some 90% of the entire global population growth between 2000 and 2025 of 1.7 billion people is expected to take place in urban areas” of developing countries. Nigerian urban settings are having the same trend like other urban settings in developing economy with its cities having the largest share. Lagos mega-city in Nigeria the object of this study is having a rapid population growth alongside urbanization growth.

The urbanization trend in most developed world is becoming an issue of necessary attention by scholars and policy makers because of the negative consequences associated with the inability of urban settings and cities to manage the new population

being experienced with their available facilities. Literatures have also showed that the consequences on the water security and water availability in the urban centers and cities with population growth that is accompanying rapid urbanization in most developed world could not be over emphasized.

The following tables from the population division of the department of economics and social affairs of United Nations Secretariat analyses the urbanization in Nigeria. Table 1.1 depicts the urban population growth in Nigeria since 1950 and its projection till the year 2050 (United Nations, 2008). The table suggests that the Nigerian urban population is growing faster in the first two decades following 1950. It doubled by the end of the 1950-1960 decades and as also by the end of the 1960-1970 decades. However, since then it started to slowdown.

Table 1.1: Urban Population in Nigeria (1950-2050)

Urban population (thousands)

1950-2050

Year	Urban population	Year	Urban population	Year	Urban population
1950	3 468	1985	25 979	2020	109 772
1955	4 638	1990	33 325	2025	126 634
1960	6 845	1995	42 372	2030	144 246
1965	9 574	2000	53 048	2035	162 461
1970	12 208	2005	65 270	2040	181 022
1975	15 616	2010	78 845	2045	199 568
1980	20 311	2015	93 767	2050	217 726

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Retrieved Monday, March 15, 2010; 4:32:16 AM. From <http://esa.un.org/unup>.

Table 1.2 shows that the rural population in Nigeria has been in a much slower rate as compared to the urban population as depicted in Table 1.1.

Table 1.2: Rural Population in Nigeria (1950-2050)

Rural population (thousands)

1950-2050

Year	Rural population	Year	Rural population	Year	Rural population
1950	30 492	1985	55 619	2020	83 328
1955	33 212	1990	61 129	2025	83 495
1960	35 511	1995	66 638	2030	82 609
1965	38 037	2000	71 725	2035	80 813
1970	41 556	2005	76 086	2040	78 212
1975	45 546	2010	79 465	2045	74 893
1980	50 753	2015	81 948	2050	70 970

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Retrieved Monday, March 15, 2010; 4:32:16 AM from <http://esa.un.org/unup>.

Table 1.3 below shows that the urban annual growth rate in Nigeria is faster (between 5.81% and 7.78%) in the first fifteen years following 1950 and began to decrease gradually with the projected growth rate being only 1.74% by 2050. It was 5.81% in the 1950 and 4.92% at the end of 1985. It was 4.49% at the end of year 2000 and with projected growth rate of 1.74% by the end of 2050.

Table 1.3: Percentage Urban Annual Population Growth rate in Nigeria (1950 -2050)

Urban annual growth rate (%): 1950-2050

Year	Urban annual growth rate	Year	Urban annual growth rate	Year	Urban annual growth rate
1950-1955	5.81	1985-1990	4.98	2020-2025	2.86
1955-1960	7.78	1990-1995	4.80	2025-2030	2.60
1960-1965	6.71	1995-2000	4.49	2030-2035	2.38
1965-1970	4.86	2000-2005	4.15	2035-2040	2.16
1970-1975	4.93	2005-2010	3.78	2040-2045	1.95
1975-1980	5.26	2010-2015	3.47	2045-2050	1.74
1980-1985	4.92	2015-2020	3.15		

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Retrieved March 15, 2010; 4:36:38 AM from <http://esa.un.org/unup>, Monday,

Table 1.4 below shows that the annual growth rate in percentage in the rural areas in Nigeria continued to increase from the 1950-1955 value of 1.71% to 1975-1980 value of 2.16%. It was 1.89% at the end of 1985% and 1.89% between 1985-1990. From the 1990 the percentage rural annual growth rate started decreasing. It is 0.87% at the end of 2010 and -1.07% at the end of 2050.

Table 1.4: Percentage Rural Annual Population Growth rate in Nigeria (1950 -2050)

Rural annual growth rate (%) 1950-2050

Year	Rural annual growth rate	Year	Rural annual growth rate	Year	Rural annual growth rate
1950-1955	1.71	1985-1990	1.89	2020-2025	-0.04
1955-1960	1.34	1990-1995	1.73	2025-2030	-0.21
1960-1965	1.37	1995-2000	1.47	2030-2035	-0.44
1965-1970	1.77	2000-2005	1.18	2035-2040	-0.65
1970-1975	1.83	2005-2010	0.87	2040-2045	-0.87
1975-1980	2.16	2010-2015	0.61	2045-2050	-1.07
1980-1985	1.83	2015-2020	0.33		

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Retrieved March 15, 2010; 4:35:29 AM from <http://esa.un.org/unup>, Monday,

Table 1.5 depicts the Percentage Urban Population. The population of urban was 10.2% in 1950 but continue to rise. It was 22.7% in 1970, 28.6% in 1980 and 49.8% in 2010 and projected 75.4% in the year 2050

Table 1.5: Percentage Urban Population in Nigeria (1950 – 2050)

Percentage urban (%)

1950-2050

Year	Population urban	Year	Population urban	Year	Population urban
1950	10.2	1985	31.8	2020	56.8
1955	12.3	1990	35.3	2025	60.3
1960	16.2	1995	38.9	2030	63.6
1965	20.1	2000	42.5	2035	66.8
1970	22.7	2005	46.2	2040	69.8
1975	25.5	2010	49.8	2045	72.7
1980	28.6	2015	53.4	2050	75.4

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2007 Revision*, Retrieved Monday, March 15, 2010; 4:36:38 AM [from http://esa.un.org/unup](http://esa.un.org/unup).

Comparative analysis of the urban and rural population data given above shows the Nigeria urban population was about 3.5 million in 1950 and rose to about 78.8 million at the end of 2010. It is projected as 217 million in 2050. The data shows the rural population was about 30 million in 1950, 79 million in the year 2010 and 70 million in 2050. The Nigeria urban annual growth rate in percentages compared to the rural annual growth rate depicts the urban annual growth rate was 5.81% between 1950-1955 while the rural annual growth rate at the same time was 1.71%. The urban annual growth rate was 3.78% by 2005-2010 (Table 1.4) while rural is 0.87 (Table 1.3). In the year 2045-2050, the urban annual growth rate is projected as 1.07% and its rural counterpart as -1.07%. The indicators show the influx of people to urban areas. Table 1.5 indicates that by the year 2050, about 75 percent of Nigeria will be residing in urban areas leaving twenty five percent in the rural areas.

Urbanization Trend in Lagos Mega-City

This section traces through historical antecedents the urban growth and trend of Lagos as a piece in line with the urbanization trend in Nigeria. It is inferred that traditionally, the Yoruba resides in urban areas in pre-colonial days, which were believed to have stimulated trade across the region with the organization of the regions into series of kingdoms and chieftaincies, which were reinforced by the colonial administrations (Barkans, Gboyega & Stevens, 2001). Lagos mega-city being a Yoruba town could be agreeably grew through its prospective and trade characteristics that have been attracting migrants especially as it was an island which over shot to the coast.

Nigeria became a single entity in 1914 through the amalgamation of two British protectorates called the Northern and Southern protectorate. It is surmised that the primary reason for the amalgamation was economic not political (Barkans et al., 2001). This might have supported the choice of Lagos as the capital city of Nigeria. It is noted that Lagos, being one of the twentieth century large cities in Nigeria, was favored by advantageous physical resources as a distribution and commercial centers for foreign countries (Jarwon, 1988). This contributes to the continuous growth.

Lagos as the country's capital city is situated in the western region of Nigeria. The Western region of Nigeria was at that time one of the major producers of cocoa in West Africa and the economic hub of Nigeria prior to the discovery of oil which is now Nigeria's main revenue (Barken, et al., 2001). This suggests that the social and economic progress tends to be associated with urbanization (Lundqvist, et al., 2003). Lagos was the 31st most populous city in the world in 1985 but the population continued to soar and it became the 6th mega-city and Africa's foremost urban center by the year 2000 (Lagos State Government, 2010).

The table below depicts the population projection of Lagos from the year 1985 to 2020.

Table 1.6 Lagos Mega-city Population

Year	Population (million)
1985	5.8
1990	7.7
1995	10.28
2000	13.42
2005	16.85
2010	20.19
2015	24.6
2020	35

Source: UN-Habitat 2002 Report, LASEED 2005-2007 cited in Lagos State Government, 2010,p. 20

Table 1.6 depicts the Lagos population as 20.19 million while it will be 35 million by the year 2020. Cross checking the population growth with the Nigeria’s urban and rural population data as depicted in Table 1.1 to Table 1.5, it will be seen that Lagos mega-city is also a product of urban growth through rural-urban migrations. Lagos retained its industrial and commercial attributes as the capital city of Nigeria and continued to maintain this purposes till now. Abuja is now the current capital city of Nigeria. Lagos mega-city industrial and commercial attributes contributes to its population growth.

The Lagos Mega-City and its Urban Governance

This section identifies the importance of urban governance in the management of water security. It thereby traces the local governance of Lagos to the pre-independent period of Nigeria. The study found that the central government of the pre-independent Nigeria was situated in Lagos. It was organized in Lagos with the presence and location of the central secretariat of the government and the seat of governance for the Governor General (Barken et al, 2001). This was the foundation for the governance having concentration of power at the center than the state and the local government.

Nigeria became independent in 1960. During the last 50 years since independence, Nigeria has been ruled by military dictatorship for close to twenty-nine years out of the fifty years of independence. The new democratic dispensation came about in 1999 while the structures of governance have been impacted with the culture of repression of the citizenry. Lagos mega-city had its own share of the repressive rule. This impacted infrastructural development because the people, and communities were seldom consulted for their needs.

The organization of Nigeria as a federated state came into force in 1954 with the responsibility for the provision of most public goods, which were to be shared between the federal and state governments (Khemani, 2004). The federation delineates more power to the central government and the state with the local having the least power.

The local governance in Lagos city was weak politically, financially and administratively (Rakodi, 2005). Thereby, making the city government not financially and technically capable to manage the constant growth of the city. The basic need of the residents of the city like potable water was not given consideration by the state and federal governments, which suppose to have the principal responsibility for basic services. Makinde (cited in Oluwashola, 2007) remarked that in Lagos less than 35 percent of the resident has access to drinking water as compared to other Nigerian cities where supply goes to about 80 percent.

The failure of government of the past and structural adjustment policies, contributed to the failure of service provision and delivery (Rakodi, 2005). Therefore, the rapid urban growth associated with structural adjustment, currency devaluation, and state retrenchments led to mass production of slums (Davis, 2006). It could be inferred from the statements of Rakodi (2005) and Davis (2006) above that the water insecurity in the mega city might have been compounded by inadequate service delivery and production of mass slums caused by structural adjustment policies. With the weak economies of the government, growth of slums and population, city local governance there will be need of adequate resources both technical and finances to manage its water security.

WATER INSECURITY IN LAGOS MEGA-CITY

This section focuses on water shortage as an aspect of water insecurity in Lagos mega-city. Even with the socio-economic development of many cities, water shortage is becoming one of their perennial problems. It is of note that the socio-economic development of a location is expected to bring about rapid urbanization. Thus, it is expected that economic and socio-infrastructure activities may attract migrant to seek permanent abode in urban centers and cities. Historical analysis has shown the presence of wholesome water as one of the socio-infrastructure attributes of the urban centers and cities. Most developed economy urban centers sustain this attributes but it is becoming a challenge to developing economy growing urban centers and cities.

Lagos in its early developmental stage in the 1960s was a city with an attractive socio-economic infrastructure, which include the availability of potable water and good health infrastructures. These two socio-infrastructure developments apart from socio-economic development might have contributed to the influx of people to the city. The major water works in Lagos rely on surface water from rivers while the other depends on groundwater but large shortfalls have increasingly been experienced since the end of British rule in 1960 (Olukoju, 2007). As in 2009, the Lagos water corporation has three main sources of water through the water works, which are Ogun, Otta Ikose, and Owo which are supported by boreholes (Lagos Water Corporation, 2009). It is of note that not all the areas in Lagos were connected to the water pipe of the water works from inception.

The challenges of continuous growth in population, industries and built environments increased the demand for clean and potable water which its infrastructural development could not meet. This study thereby agrees with Abu (2004) in the article *Water Policy and Women Status in Nigeria* where he *inferred* that even with the lofty and ambitious governmental policies and declarations the water situation is still at the throes of major crisis. This is because there have been governmental

approaches at different times of solving the water crisis but they have not provided the necessary solution. Abu (2004) reiterated that the water shortage problem of Lagos would have been tackled if the Federal Government of Nigeria has implemented of the master plan for Lagos water supply system.

The scheme was to increase production of water at the water works (now Lagos State Water Corporation) from 18 million gallons per day in 1975 to 84 million gallons per day and 210 gallons per day in 1985 but the Nigerian government instead of implementing the scheme settled for an interim relief (Abu 2004). This scheme would have progressively accommodated the continuous growth of the city, if it has been implemented but the scheme might have not been the solution to the city problem since the solution is only targeting the sector leaving aside the interconnected resources and the society.

At present, the sole agent expected to provide potable water for the people of Lagos is still the Lagos Water Corporation, which was known before as the Lagos water works. The Lagos State Water Corporation has now a capacity from all its water plants for about 150 mgd (million gallons per day), but has a production capacity of 130 mgd (George, 2010). Table 1.7 below depicts the capacity of the water works given by the Lagos Water Corporation the sole potable water producer of the mega-city in the year 2009 according to the capacities of the available waterworks.

Table 1.7: Waterworks and their Capacities in Lagos

S/N	Water works	Capacity
1	Adiyan water works	72 mgd
2	Iju water works	45 mgd
3	Isheri water works	4 mgd
4	Mini water works	28,64 mgd
5	Micro water works	4 mgd
6	Total	151.64mgd

Source; Lagos Water Corporation (2009).

This production and capacity of Lagos State Water Corporation cannot meet up with the current projected demand for water in Lagos of 650 million gallons per day (George, 2010). The production of water by the corporation for the mega-city is only 20 percentage of the expected potable water needs capacity per day for the mega-city. Thus, it has a deficit of 80 percentages capacity per day. This does not include the water that may be lost during distribution.

Also an assessment conducted in Agege area of Lagos revealed that about 72 percent of the respondents were either getting their source of drinking water from well or buying water as shown in the table 1.7 below (Osinubi, 2003).

Table 1.8: Source of Drinking Water in Agege area of Lagos

Type	Frequency	Percent
Pipe in the house	17	17
Public tap	11	11
Well	30	30
Buying	42	42
Total	100	100

Source: Field report survey 2003 (Osinubi, 2003)

Moe and Rheingnans (2006), in their article titled *Global Challenges in Water, Sanitation and Health* said the water supply only covers 35% of the Lagos population, with 60% of water produced lost through leaks and illegal connections. The paper also mentioned that 65% of the population was relying on private wells, boreholes and water vendors” (p. 10).

Data given by Moe and Rheingnans (2006) and George (2010) above shows that the mega-city is facing inadequate supply of potable water to its residents. The urban improved water coverage data in Nigeria was observed by the latest WHO and UNICEF Joint Monitoring Programme report, it shows continuous decline with vast majority having no access to treated water and Lagos was reported to have only 26% of its citizens connected to piped water in the year 2006 (Acey, 2010). This might have been because, the planning and management process of the Lagos State Water Corporation the supposedly sole provider of potable water in Lagos has not been able to provide for the required needs of the population. This allows for some of the residents to depend on alternative sources whose quality is in doubt. It has also been noted that erratic power supply compounds water supply situation for the residents that are connected to the Lagos city supply (Ajibade 2000, Ugwary 2003, Olukoju 2004 cited in Olukoju 2007). This cuts supply of water to them when there is outage. The government aims of privatization of the sole water provider Lagos State Water Corporation as a means of ameliorating the water problem in the mega-city also met with financial weakness thereby inhibiting the proposed strategy (Olukoju, 2007).

Shortage of Potable Water in Lagos Mega-city and Health Security

The section examines the implication of unwholesome water supply or intake in Lagos mega-city. Supply of potable water is important to sustain the health conditions of cities since water is an essential part of human food and a key aspect of sanitation. Thus, as emphasized earlier, there are always health implications of water insecurity or shortage of potable water in the developing economy urban areas or cities even though they are expected to be places of health security. This paper agrees with Borrel and Hatch (2005) in their article titled the “*Role of Urban Environment*” where they reiterated that the association between health and urban areas has not been directly investigated per se but agreed in the health advantage of urbanized area. The authors also surmised that the economic development and higher levels of community resources in urbanized community can facilitate dissemination of health related information that leads to better health.

In this vein, it is expected that developed economy urban areas and cities having qualitative health facilities will deliver qualitative potable water to their residents. This encourages the eradication of waterborne diseases thereby a support to its health

security. Therefore, the inability to supply quality water for consumption in cities and urban areas may have implication on urban health security. It would be seen from the data given in the preceding session that the supply of potable water is inadequate in Lagos thereby allowing for alternative sources that may not be wholesome for consumption. This may have implication on the city's health security.

Research conducted in Lagos mega-city by Egwari and Aboaba (2002) titled *Environmental Implication of the Bacteriological Quality of Domestic Water Supplies in Lagos, Nigeria* the researchers affirmed that "water remains the major source of transmission of enteric pathogens in developing economy". The researchers emphasized that there is high incidence of childhood diarrhea despite the intensive activities of National Diarrhea Control program in Nigeria and related it to unhygienic sources of water used by mothers in preparing weaning foods.

The reliance on the wholesomeness of the taps water in Lagos becomes doubtful with the assertion of Egwari and Aboaba (2002) that the available water pipes connected to the Lagos state water corporation runs through drainage system and are also decaying due to lack of maintenance thereby increases chances of contamination.

Shortage of Potable Water in Lagos Mega-City and the Poor

This section identifies the implications of shortage of potable water to the poor people in the mega-city. Even though one of the main driver of migrants to urban center is to have a dignified life, thereby making economic reason a primary factor for rural urban migrants. The human dignity being sought by rural-urban migrants cannot be achieved unless there is access to safe drinking water and sanitation facilities (Abu, 2004). This basic necessity of life, which could be seen as basic human right, is not available to everyone in the mega-city.

With the estimation of about 48% of urban dwellers in Nigeria living in poverty (Federal Republic of Nigeria, 2000), the extra effort to get water by residents may lead to additional cost on the citizens (Lundqvist et. al. 2003). This will invariably have more economic implications on the poor and down trodden. In the developing countries, the people who do not have access to tap water often pay more for potable water than the people that are having taps thereby spend higher proportion of their income on water (UN_Habitat, 2003 and Sivana, Alpana and David Evans 2001 in Mitlin, 2003). This infers the negative effect of shortage of potable on urban poor in Lagos mega-city.

Water shortage may aggravate the rate of unemployment in the mega-city because of its negative implications on manufacturing industries. It has been noted that small firms cannot afford their own borehole facilities, thereby making "the burden of inadequate public water supply affects their development more seriously than those of large size firms" (FRN, 2000). The development of the small firms will have positive contribution to the mega-city by increasing the number of jobs available to residents in the seemingly tight economy. The inefficiency of water supply may also affect the productivity in industries, thereby increasing the cost of production (FRN, 2000). This will invariably have negative impact on the cost price of products. Thus, it will make the price of goods that requires water to soar. This brings additional cost on the poor and down trodden that are trying to survive the harsh economy condition

Slums Development and Water Insecurity in the Lagos Mega-City

This section discusses the growth of slums in the mega-city and its relationship to water insecurity. This is because slums are fast becoming a normal phenomenon when discussing issues of urban development in developing economy. The bleak picture of water insecurity can be clearly present in the fact when three quarters of urban population in developing countries live in slums (Myers & Kent, 2005). According to UN-Habitat, “the numbers of slum dwellers is increasing at almost the same rate as city populations” (cited in Brown & Kristiansen, 2009). Thereby the “much of the growth in mega-cities is in the slum and squatter settlements which are particular challenging to service” (Moe & Rheignans, 2006).

The presence of slums and shanties in mega-cities could be associated with the level of poverty in the economically globalized community. Lagos mega-city was found to have 42 slums, which the systems have not guaranteed for distribution of basic services (The Punch, 2008). The mega-city water insecurity may be more costly to the people in the slums of the mega-city.

The health conditions of the slums of the mega-city could be determined by the condition of their domestic water since unwholesome water and inadequate sanitation could contribute to health hazards. This makes the slum dwellers more vulnerable to negative health impacts that are associated with non-availability of drinkable water. Slum dwellers at most times dig well for their water needs.

In a research conducted by Egwari and Aboaba (2002) on domestic water in Lagos, they isolated Vibrios and Campylobacters (microorganisms) in wells located in highly populated slums characterized by overcrowding, poor sanitation and absence of pipe-borne water where the residents rely mainly on well water for drinking and other domestic activities. The authors signal a possible outbreak of Cholera and /or campylobacter epidemics in the affected area (Egwari & Aboaba, 2002). Yusuf (2007) in an investigation conducted on different dug wells in Lagos indicated the pollution of groundwater by range of species including trace metals and solids thereby making it requiring further purification to ensure suitability for human consumption.

Lagos and Integrated Water Resource Management (IWRM)/Integrated Urban Water Resource Management (IUWRM)

This section examines the Lagos plan solution to its water shortage and compares it to the principles of IWRM/IUWRM. The concept of integrated water resource management (IWRM) or integrated urban water resource management includes the collaboration of engineering and economic professional with social and political scientists (Braga, 2001). It embraces all stakeholders and actors in water management.

The Lagos water corporation chose Private Sector Participation (PSP) as a succor to its water insecurity. This policy thrust tends towards sectorial management of its water resources as compared to the developmental concept of IWRM/IUWRM. This may not be strange since conventionally each government sector (waste, food, health, land etc) manages its own concern with no consideration of the other sectors. Likewise potable water availability to Lagos mega-city residents managed by the

Lagos Water Corporation is solely focusing on providing water for the mega-city without considering other sectors. Consideration of the urban and city as an interrelated system is the principle behind the principle of IWRM (Braga, 2001). IWRM/IURWM is a multi-sectoral approach to water management.

Even though the aim of Lagos Water Corporation is to make potable water available to the Lagos citizens but it never consider water as an inter-dependent resource or ecological goods that need to depend on the entirety of the ecosystem. The focus of the Lagos Water Corporation to privatize the Lagos water sector through its Private Sector Participation processes has been in pipeline since 2004. The PSP project of the Lagos Water Corporation is not only focusing on the water needs of the residents but also has commercial under tone with profiting as part of its aim (Okpanechi 2009). This is in conflict with the principle of IWRM/IURWM. Okpanechi (2009) in the article *Water and Urban Development Paradigms* examined the privatization intent of Lagos water deducing that privatization as a term is not used in the convectional sense of complete transfer of public hands into private but “loosely as Private Sector Participation” (PSP). This he agreed is a range of transferring of part of assets in concession or management responsibility or in case of management of contracts or lease contracts (Okpanechi 2009 citing Raof, 2006). The PSP structure is not including the management of other resources as it is in the case of IWRM/IURWM.

The growing focus on commercialization by the proponents of Lagos Water PSP initiative falls in line with the mission of the Lagos Water Corporation “of collecting enough revenue to sustain effective operation”. This is at variance with the principle of IWRM/IUWRM which focuses on the sustainability approaches to water management with the focus of managing the resource and its interconnectedness with other natural resources (such as land, storm water, waste etc) and the ecosystem.

This current move of the Lagos Water Corporation is in disagreement with the laudable principles of IWRM/IUWRM because Lagos Water Corporation has not been able to identify or realize that the mega-city should be addressed as a system or a natural entity. The PSP initiative of Lagos Water Corporation could be looked at as a short-term approach that may not sustain its water security.

The PSP initiative being propounded by the Lagos Water Corporation is a direct governmental initiative aimed at solving its water shortage problems by focusing and addressing the functionality of its organization. This is addressing the present needs with no consideration of water as ecological good. The high points of the project of the Lagos Water Corporation is stated as the injection of private funds with entrepreneurial spirits and skills, modern technology and management with improved efficiency and customers’ service which the corporation assumed will increase access to water (LWC, 2007). This purposeful statement does not encompass the management of water with other resources and its ecosystem. Managing water as an ecosystem is vital for its and ecosystems sustainability (Rogers & Hall, 2003).

The PSP initiative being pursued by the Lagos Water Corporation could be seen as being in disparity from the working principles of IWRM/IUWRM since it is a top down approach being a “baby” of the government with the International Finance Corporation (IFC), a sister organization to the World Bank as advisor (LWC 2007, 2009). IWRM/IURM imbibes

the multiple objectives, multiple-decision maker models in which all the stakeholders establish a democratically established committee for the management of the water resource (Braga 2001). The Lagos approach could be regarded as sectorial approach to the management of water since only potable water availability is the focus and not the water security in its entirety, which could only be addressed through the foci eye of the mega-city as a system.

CONCLUSION

Water Security is essential to the development and growth of urban settings. It is the hinge that anchors human and environmental security. The research emphasized that rapid urbanization in developing economy has made water security not achievable which may be tantamount to increasing health, economy and social insecurity of the urban residents. The study agreed that rapid urbanization due to continuous population and economic growth with incomparable infrastructural development contributed to the shortage of potable water in Lagos, a developing economy mega-city.

It found ineffective planning by the city government as the bane of the water shortage in the mega-city. It also found that the continuous growth of the mega-city leads to the development of slums and shanties with many of the slums depending on unwholesome water. Since many of the slums were not connected to the public water supply. The dependency on alternative sources of water by many slums dwellers and residents not connected to the public supply may have health security implications on the city. Apart from the health security that may be hampered, it was inferred that alternative source might place undue economic stress on the residents especially the poor that are more hit by the water shortage.

The study realized that the PSP initiative project of the Lagos Water Corporation examines water in a sectorial approach leaving behind other resources, society and the entirety of ecosystem that are supposedly interconnected with it.

The right to potable water is a fundamental human right of every citizen, this study as a matter of conclusion is advocating integrated approach to water management as a panacea to solving the water shortage problem of the developing economy mega-city. This integrated approach is expected to embraces all stakeholders' participation. The stakeholders who should include representatives of the government, private sectors, community based organization, faith based organization, nongovernmental organization and water professionals. The integrated approach is expected also to adopt the principles of the developing concepts of Integrated Water Resources Management (IWRM) and Integrated Urban Water Resources Management. The IWRM/IUWRM will need to adapt to Lagos context not a borrowed procedure through stakeholders' forum.

This effective management procedure cannot be devoid of understanding of developmental technologies and concepts. Thus, city education is essential and paramount to sustainable practice of the suggested IWRM/IUWRM technologies. The city government will need to enlighten the inhabitants (all stakeholders) of the mega-city on the appropriate and acceptable technology that are going to be used in driving its water security. This will encourage the acceptance of the technology by the mega-city residents.

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