Spatial variations in access to improved sanitation and water in Lagos state

Michael Kunnuji

ABSTRACT

Research has documented the connection between poor waste management and the contamination of ground and surface water across the globe and in Lagos in particular. This makes access to improved sanitation and water central to the pursuit of a good quality of life. This paper set out to explore variations in access to improved sanitation and water across Local Government Areas in Lagos state. Secondary data from the 2006 census of the Federal Republic of Nigeria were used. The study shows that access to improved sanitation and water is not equitable in the state. Collection of domestic solid waste ranges from 4 to 73% while access to improved water provided by the water corporation in the state ranges from 2 to 50%. The paper concludes that access to improved sanitation and water in Lagos is largely 'metropocentric'. The implication is a high likelihood of variations in the incidence of cholera and waterborne diseases in the non-metropolitan parts of the state. The paper recommends concerted research-based intervention aimed at increasing access to sanitation and government-provided safe water in the non-metropolitan parts of Lagos state.

Key words │ equitable distribution, Lagos state, *metropocentric*, pipe-borne water, waste collection

Michael Kunnuji
Department of Sociology,
University of Lagos,
Nigeria
E-mail: *michaelkunnuji@gmail.com*

INTRODUCTION

The most recent census exercise in Nigeria put the population of Lagos state at 9.1 million inhabitants (National Population Commission [NPC] 2009) although the parallel count by the state government revealed a population of 17.6 million inhabitants (Lagos State Government [Lagos Bureau of Statistics] 2005). The state covers a land area of 3,671 square kilometres (Federal Republic of Nigeria [National Bureau of Statistics] 2009); about 22% of which is occupied by water bodies (Lagos State Government [Lagos Bureau of Statistics] 2012); resulting in a population density of about 3,270 persons per square kilometre as at 2006. Since the population is growing, it is to be expected that the population density has also grown. A higher density is recorded in the metropolitan part of the state, which has smaller land area and greater population. A major implication of this is the likelihood for urban facilities to be strained beyond their carrying capacities. There is also a

high likelihood that access to improved sanitation and water provided by the water corporation is low. According to the UN (2010: 170), about 68% of Nigerians do not have access to improved sanitation and about 42% of Nigerians do not have access to improved water (UN 2010: 170). Of particular interest here is access to improved sanitation and water in the state as a whole and across local administrative boundaries within the state.

For the purpose of this study, improved sanitation is defined by access to solid waste collection by Lagos Waste Management Authority (LAWMA; the state agency with the responsibility for solid waste collection and treatment). The study does not explore the treatment of wastewater as the secondary data employed does not include information on the treatment of wastewater. For the purpose of this study, water provided by the State Water Corporation is considered improved water because it is treated to make it fit for

doi: 10.2166/washdev.2014.102

domestic use. A brief review of literature on the nature, implications and interconnectedness of the problems of poor access to improved sanitation and water is presented in the paragraphs that follow.

The amount of waste generated in any settlement is often a function of population and level of industrialization, among other factors (Babayemi & Dauda 2009). Taiwo et al. (2012) attribute water pollution to industrialization and urbanization which is closely related to the factor of population. Lagos state ranks high on these two major indices (industrialization and population/urbanization), the implication being that a huge amount of waste is generated in the state. Yet less than 20% of waste generated in Lagos is recovered/recycled (Ibiyemi 2008). In a month, more than 45,000 metric tons of solid waste is collected and deposited at landfills by the LAWMA (LAWMA 2011). Also, not all wastes generated in the state are collected by LAWMA. About 25% of the households treat their wastes in various ways not approved by the government of the state (NPC 2009). Poor management of waste in a place like Lagos has serious health implications, as shown by Adejobi & Olorunnimbe (2012). Even with government approved landfills, there remain unresolved issues of health concern. Recent studies have shown, for instance, that wells around a major landfill, like the one located in Olusosun, Lagos, were found to contain contaminants, as wastes not properly disposed of contaminate groundwater (Longe & Balogun 2010; Omole & Isiorho 2011; Kola-Olusanya 2012; Eruola et al. 2013). In addition, activities of butchers in abattoirs impact on surface water quality negatively (Galadima et al. 2011).

Apart from the problem associated with poor management of solid waste, poor sewage disposal also has implications for the quality of ground and surface water. Generally, well water (Adelekan & Ogunde 2012) and surface water (Chinedu et al. 2011) have been found to be contaminated and unfit for domestic use in Lagos. Research has documented the pollution of groundwater as a result of poor sewage disposal (Awomeso et al. 2010; Adelekan & Ogunde 2012; Eruola et al. 2013). Through research also, it has been shown that water from lagoons, lakes and rivers is also polluted as a result of poor sewage disposal (Awomeso et al. 2010; Okoye et al. 2010; Galadima et al. 2011). Groundwater sourced from wells can also be contaminated by contaminated surface water as a result of surface water intrusion into wells

(Awomeso et al. 2010). Consequently, water sourced from wells is often found to contain bacterial pathogens, which make the water not fit for domestic use (Akinyemi et al. 2006).

Water from other sources can also be contaminated and made unfit for domestic use. A study by Adegoke et al. (2012) has documented the presence of staphylococcus in sachet water. The study further shows that only about half of the brands of sachet water meet the World Health Organization standard for drinking water. Environmental pollutants and poor handling of sachet water by vendors can lead to contamination with dire health implications (Omalu et al. 2010). In addition, pollutants released into the ground and air contaminate sachet water, as samples were found to contain high levels of heavy metals (Oguntona et al. 2012). Water supplied using water tankers also contains faecal contaminants (Olaleye 2011). Samples of tap water have also been found to contain bacterial pathogens due to sewage intrusion, but only where pipe leakages exist (Akinyemi et al. 2006). In the absence of this, pipe-borne water is safe for domestic consumption (Akiyode 2011).

Based on research, it is clear that sourcing water for domestic use from wells, lagoons/lakes/ponds, tankers/vendor and sachet water comes with negative health implications. Water pollutants such as faecal contaminants (Awomeso et al. 2010; Olaleye 2011; Kola-Olusanya 2012); and high metal levels (Oguntona et al. 2012) are all injurious to health. Inadequacy of good water sources has been associated with the spread of cholera and other waterborne diseases in Nigeria (Awomeso et al. 2010; Adagbada et al. 2012; Oyegoke et al. 2012). This social problem underlies the interest in access to improved sanitation and pipe-borne water in Lagos state. A recent study shows that rural communities in Nigeria are neglected in the provision of potable water. This leaves these communities with other unsafe options such as hand-dug wells, which are prone to failure due to the intrusion of salt water and poor maintenance (Longe et al. 2009). The study seeks therefore to explore the metropolitan/non-metropolitan and overall spatial dimension to access to pipe-borne water. The study discusses access to waste collection by the Lagos Waste Management Agency (LAWMA), and access to pipe-borne water supplied by the Lagos State Water Corporation (LSWC; which is responsible for the provision of water in all parts of the state). It also seeks to explore spatial

variations in access to improved sanitation and pipe-borne water. Suggestions are proffered for better state service delivery in the areas of sanitation and water.

METHODS

The study uses secondary data derived from the 2006 population and housing census of the Federal Republic of Nigeria. The data refer to all the Local Government Areas (LGAs) in Lagos state, which include the urban as well as the rural parts of the state. The questionnaire employed for the census has a section on housing characteristics and amenities. In this section, questionnaire items address issues of type of living house, tenure status, source of energy, type of housing unit, ownership status, waste disposal, number of sleeping rooms, main source of water supply for domestic use, floor, wall and roof finishing materials, toilet facilities, household items, and access to telephone and television (NPC 2009: 15). Data gathered on methods of waste disposal, and main source of water supply were analysed for the purpose of this study. The chi-square test was employed to explore equitable access to pipe-borne water. The confidence interval for the test is 95%. The chi-square test was employed to compare between observed counts of people whose wastes are collected/with access to pipe-borne water and the expected counts of such people in the hypothetical situation in which there is uniform collection of wastes across the LGAs of the state. The logic of the test is that if the observed and expected counts are significantly different, there is no uniform access to waste collection. The study also used a map to show the spread of access to water in the state.

RESULTS

Background characteristics of households

In Lagos state, a total of 2,195,842 regular households were enumerated during the census exercise. More than half (54%) of the households were accommodated in rooms within let-in houses. A household may be accommodated in one, two or more of such rooms within a house. Other rooms within the house are let out to other households and toilet and kitchen facilities are often shared under such arrangements. About 20% of the households were accommodated in houses standing separately. Another 20% of the households were accommodated in flats within blocks of flats. About 53% of the households had single sleeping rooms in the state. The distribution of the households by tenure status shows that about 75% of the households occupied their lands as rent-paying tenants while 18% were owner-occupiers (NPC 2009).

Methods of solid waste disposal in Lagos state

Wastes from about 53% of these households were collected by LAWMA which has the responsibility for waste collection and treatment in Lagos state, or LAWMA-approved agents. By implication, 47% of the households did not benefit from waste collection. These include 22% of the households who used approved dumpsites; about 13% who used unapproved dumpsites and 8% of all the households in the state who burnt their solid wastes. Three per cent of the households buried their solid wastes while one per cent used other unapproved means of waste disposal. The rate of waste collection by LAWMA varies significantly across LGAs with Surulere, Agege, Ikeja, Lagos Island and Oshodi–Isolo having the highest rates and non-metropolitan LGAs of Ibeju–Lekki, Badagry and Epe having the lowest collection rates (see Figure 1). The chi-square test shows a significant association between LGA and collection of solid waste ($\chi^2 = 236{,}119.8$, p-value <0.01). It is worthy of note, though, that a metropolitan LGA, Ojo, has a collection rate of less than 30% while Ikorodu, outside Lagos metropolis has a collection rate of a little above 30% (see Figure 1). On the whole, higher rates of collection of solid waste were observed within Lagos metropolis than outside Lagos metropolis. All the LGAs in which waste collection reached more than half of the people were within Lagos metropolis. This shows that the collection of waste favours metropolitan LGAs over non-metropolitan LGAs.

Access to pipe-borne water in Lagos

About a tenth (9.8%) of the households had pipe-borne water inside their dwellings while 15% of the households had pipe-
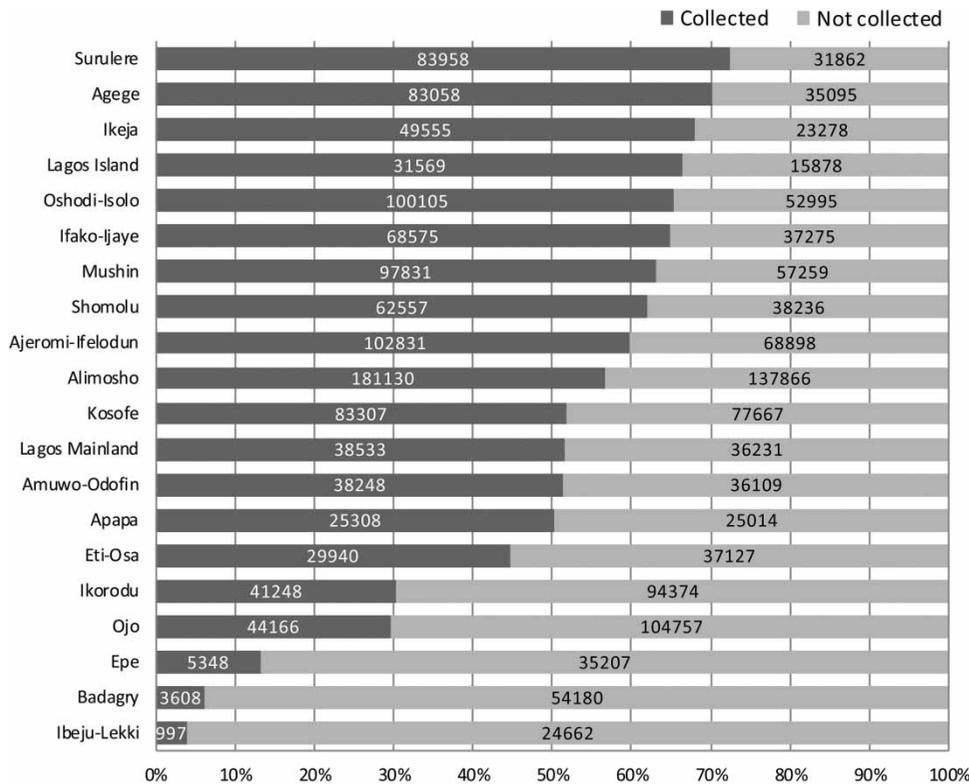
Figure 1 │ Households that benefited/did not benefit from solid waste collection by LGA. Source: Constructed with NPC (2009) data.

borne water outside their dwellings. Fifteen per cent of the households sourced water from tankers/water vendors while more than a third (33.8%) of the households had wells as their main source of water. About 22% of the households had boreholes as their main source of water while 1.6% of the people mentioned rain water as their main source of water. Other sources of water mentioned include river/stream/spring (1.6%); dugout pond/pool and dam (0.2%); and other sources (0.1%). Test results show that access to pipe-borne water is associated with location ($\chi^2 = 117{,}365.071$; $df = 19$; p-value <0.001). Access to pipe-borne water is far higher than the state average of 25% in Lagos Mainland (50%); Ikeja (39%); Kosofe (35%); Surulere (33%) and Agege (32%). In Ibeju–Lekki, Ojo and Badagry on the other hand, rates of 2, 5 and 6% were recorded in that order. Amuwo–Odofin and Ajeromi–Ifelodun had rates of 12 and 18%. It should be noted that Epe and Ikorodu, outside the metropolis, had rates of 22 and 20%, while Eti–Osa, Ajeromi–Ifelodun and Amuwo–Odofin, within the metropolis, had lower access rates (see Figure 2).

The water map (Figure 3) further shows how access to pipe-borne water is concentrated at the centre within Lagos metropolis. Access appears to decline with distance from the centre.

DISCUSSION

Studies have documented the high level of success achieved in the management of waste through private sector participation in Lagos (Idowu et al. 2011; Odewumi 2013). Yet this study has shown that while the collection of waste is high in some parts of the state, other parts, particularly the non-metropolitan parts, of the state have relatively lower rates of waste collection. In Ibeju–Lekki, Badagry, Epe, Ojo and Ikorodu, waste collection, and by implication, waste management, are largely handled by people not authorized to do so. The people sometimes resort to the use of unapproved dumpsites and other means of waste disposal such as burying and burning (NPC 2009). This study shows, therefore that access
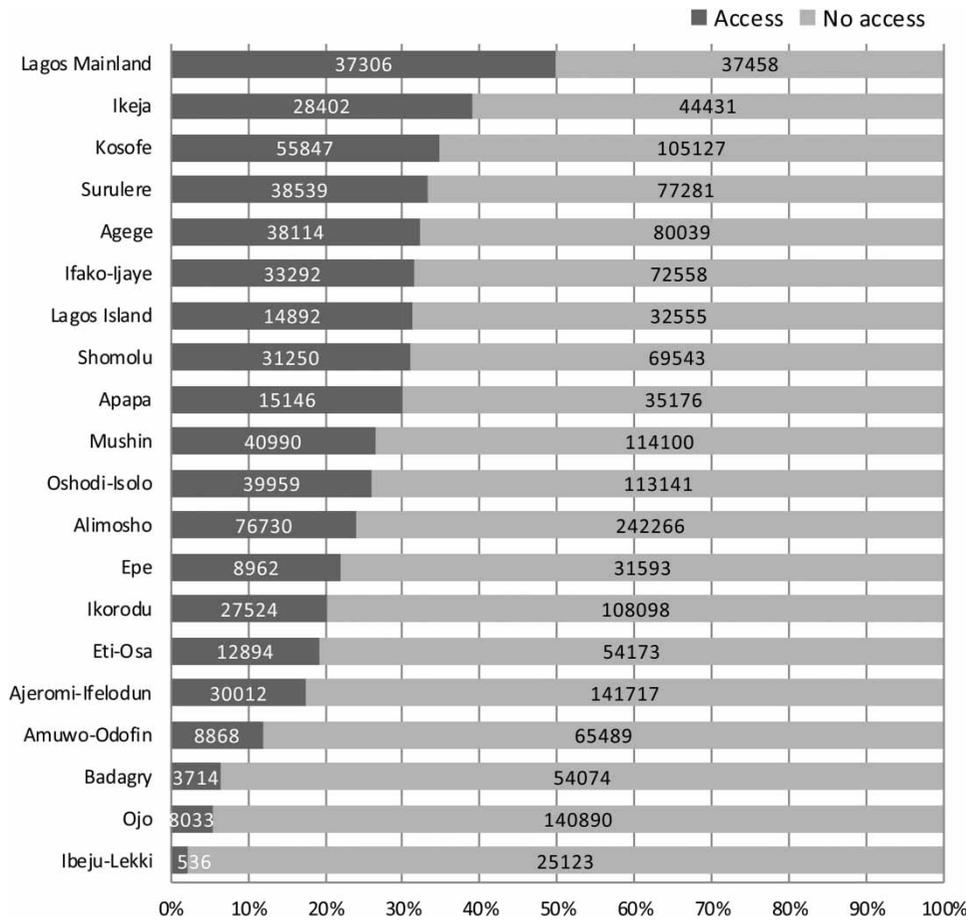
Figure 2 | Households with/without access to pipe-borne water by LGA. Source: Constructed with NPC (2009) data.
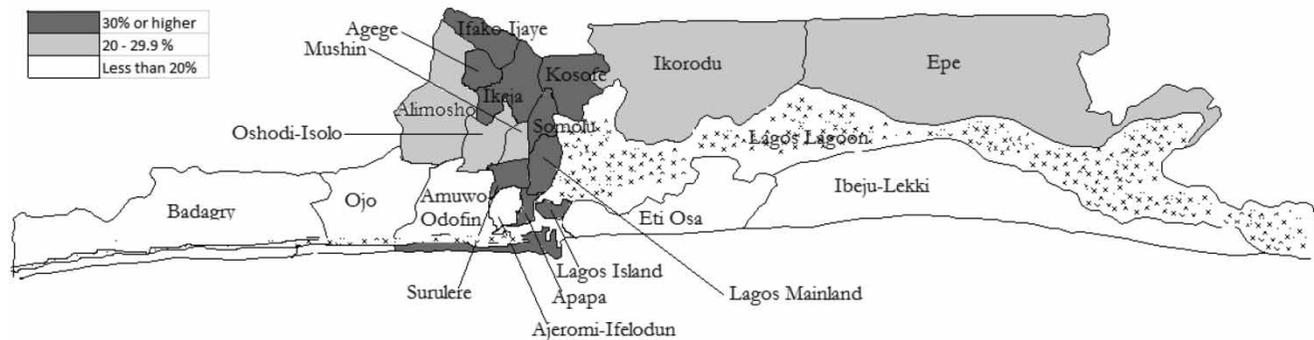

Figure 3 | Map showing access to state provided water by LGA.

to improved sanitation is a function of location in Lagos state, with access decreasing with distance from the metropolis. This is similar to what is obtainable in other states of the federation where the rural parts record lower access to improved water and sanitation than the urban parts (African Development Fund [ADF] 2007; Longe *et al.* 2009). If this remains unchecked as the city of Lagos continues to sprawl into the non-metropolitan parts of the state, the incidence of cholera may increase in the parts of the state with low rates of waste collection as earlier studies have suggested

(Adagbada et al. 2012; Adejobi & Olorunnimbe 2012). Further research is required, however, to scientifically document the correlation between access to sanitation and water, and the incidence of diseases in the state.

Within the metropolis, the study has also shown that some parts benefit more from waste collection than others. Places like Eti Osa, Amuwo–Odofin, Apapa, Lagos Mainland and Kosofe do not benefit from waste collection as much as Surulere, Agege, Ikeja, Lagos Island or Oshodi–Isolo as shown in Figure 1. Further studies will be required to show if there are variations within LGAs with the implication that some wards or streets may have greater access to waste management services than others. Another major issue has been raised by Arisukwu (2011) who argued that wastes are collected from some households and not from others. A major reason for this observation is that most times, collection trucks are made available in some communities when people are away at work and there are no people at home to drop the wastes in the trucks (Arisukwu 2011). This is typically the situation in communities occupied largely by the urban poor. In those communities, people are expected to watch out for the coming of the collection trucks and take their wastes to the trucks. In other communities within the state, however, wheeler bins are made available to the households. Wastes are therefore left in the wheeler bins, which are placed at the frontage of houses so that in the absence of the occupants of such houses, the bins are emptied by the LAWMA personnel assigned to that task. This further explains the unequal access to the services provided by LAWMA (Figure 1). Yet, those who suffer the most in situations where the physical environment in and around cities deteriorates, are the urban poor (Oyeniyi 2011). The agency for the management of waste in the state should re-strategize to address this problem of unequal access to service.

Also, for better service delivery, recycling of waste should be encouraged. At present, only about 20% of the waste generated in the state is recycled (Ibiyemi 2008). This should be improved upon through LAWMA organized re-orientation campaigns that will seek to educate the masses on the need for resource recovery. In order for recycling to be effective, wastes should be sorted for recycling from source. Research has shown that at present only a small proportion of people separate their wastes at source for recycling (Babayemi & Dauda 2009). This makes the process of recycling a very difficult one. Incentives such as waste disposal charge waiver/reduction should be given to encourage households to sort their wastes for recycling.

According to the LSWC (2013), water consumption in Lagos is about 2.3 billion (10^9) litres per day while the LSWC supplies about 955 million litres per day through its three major water works in Adiyan, Iju and Ishasi and other mini and micro water works. This gives the impression that the Water Corporation meets at least 40% of demand for water in the state. This study shows, however, that only about 25% of the water needs of the people of the state are met by the Water Corporation. The implication is that the majority of the people are left to explore other options such as wells and boreholes. As studies have shown these other sources are not safe for domestic use (Akinyemi et al. 2006; Awomeso et al. 2010; Okoye et al. 2010; Omalu et al. 2010; Akiyode 2011; Olaleye 2011; Galadima et al. 2011; Adagbada et al. 2012; Adelekan & Ogunde 2012; Kola-Olusanya 2012; Oyegoke et al. 2012; Eruola et al. 2013). This has implications for the well-being of the people of the state. At present, the city of Lagos is home to about 11.22 million people (United Nations Department of Economic and Social Affairs, Population Division 2012). This shows the enormity of the epidemic that may arise from low access to improved sanitation and water.

The Water Corporation should also create a more detailed water map for water demand and supply in the state of Lagos. Such a map will clearly show the water needs of the people. In addition, it will give room for equitable water supply within the state. As Moe & Rheingans (2006) argue, a strong political will is needed to institute and enforce, among other things, equitable water sharing in cities. This strong political will is recommended for the equitable provision of water and sanitation services in the state.

CONCLUSION

This paper concludes that while solid wastes generated in more than half of the households in the state are collected by the government agency responsible for waste management, there are sharp variations across LGAs that suggest unequal access to waste management services. Put differently, the successes recorded in waste management in the

state are 'metropocentric' as suggested by an analysis of the locations of the LGAs that benefit the most and those that benefit the least from the services of LAWMA. Therefore, access to improved sanitation is not equitable in Lagos state. It is also noted that the mode of operation of the agency varies from community to community. This is partly responsible for the non-universal success recorded in the management of waste in the state. Access to improved water takes a similar shape with few exceptions to the rule. An intervention programme has been put in place in Yobe and Osun states to bridge the gap in access to sanitation and water between urban and rural dwellers. It is, however, rather early to evaluate its success and sustainability and the potentials for its replication in Lagos state. For equitable access to improved sanitation and water to be achieved in the state, the government of the state needs to demonstrate the will to serve the people by adopting a research-based template for the provision of services in the state. This means that the government will assess access to improved sanitation and water through surveys and commence the distribution of services in line with the scientifically documented needs. In addition, relevant government agencies will also need to embark on campaigns to educate the people of the state on the need for and ways of achieving resource recovery. To encourage recycling, waste disposal charge waivers/relief or reduction should also be considered.

The findings of this study suggest that in many states that are similar to Lagos state in Nigeria, Africa and other less developed countries of the world, there may exist a natural tendency for access to water and waste disposal to be limited to the metropolitan parts. The only exceptions will be states in which there have been deliberate plans and implementation activities targeted at ensuring that access to water and waste management is not limited to the centre. In the absence of this conscious effort, the observations in this study are likely to be replicated in other places. For emerging cities across the globe, it will be helpful for relevant city planners to foresee the high likelihood of a 'metropocentric' distribution of water and sanitation. The solution is an initial plan that identifies a water and sanitation distribution strategy that prevents 'metropocentric' distribution and a periodic evaluation of water and sanitation needs which will be needed in the review of the spatial spread of

provision of water and access to sanitation across all political divisions within states.

REFERENCES

Adagbada, A. O., Adesida, S. A., Nwaokorie, F. O., Niemogha, M. & Coker, A. O. 2012 Cholera epidemiology in Nigeria: an overview. *The Pan-African Medical Journal* 12, 59, http://www.panafrican-med-journal.com/content/article/12/59/full/. Accessed 11/07/2013.

Adegoke, O. A., Bamigbowu, E. O., Oni, E. S. & Ugbaja, K. N. 2012 Microbiological examination of sachet water sold in Aba, Abia state, Nigeria. *Global Research Journal of Microbiology* 2 (1), 62–66.

Adejobi, O. S. & Olorunnimbe, R. O. 2012 Challenges of waste management and climate change in Nigeria: Lagos state/metropolis experience. *African Journal of Scientific Research* 7 (1), 346–362.

Adelekan, B. A. & Ogunde, O. A. 2012 Quality of water from dug wells and the lagoon in Lagos Nigeria and associated health risks. *Scientific Research and Essays* 7 (11), 1195–1211.

African Development Fund [Water and Sanitation Division] 2007 *Rural water supply and sanitation sub-programmes in Yobe and Osun states: Appraisal report.* African Development Fund, Abidjan.

Akinyemi, K. O., Oyefolu, A. O. B., Salu, O. B., Adewale, O. A. & Fasure, A. K. 2006 Bacterial pathogens associated with tap and well waters in Lagos, Nigeria. *East and Central African Journal of Surgery* 11 (1), 110–117.

Akiyode, O. O. 2011 Urban safe water and millennium development goals in Lagos mega-city, Nigeria. *Journal of Sustainable Development and Environmental Protection* 1 (3), 41–50.

Arisukwu, O. C. 2011 The political economy of refuse collection and disposal in Nigerian urban centres. *Journal of Sustainable Development in Africa* 13 (8), 214–224.

Awomeso, A. J., Taiwo, A. M., Orebiyi, O. E., Orekoya, A. O. & Odjegba, E. E. 2010 Effect of untreated sewage dump on the quality of groundwater in Iddo community, Lagos, Nigeria. *Journal of Agricultural Science and Environment* 10 (1), 98–106.

Babayemi, J. O. & Dauda, K. T. 2009 Evaluation of solid waste generation, categories and disposal options in developing countries: a case study of Nigeria. *Journal of Applied Science and Environmental Management* 13 (3), 83–88.

Chinedu, S. N., Nwinyi, O. C., Oluwadamisi, A. Y. & Eze, V. N. 2011 Assessment of water quality in Canaanland, Ota, Southwest Nigeria. *Agriculture and Biology Journal of North America* 2 (4), 577–583.

Eruola, A. O., Olowu, R. A., Ogunyemi, I. O. & Adedokun, N. A. 2013 Assessment of effect of sewage intrusion from septic tanks into the consumable hand dug wells in Lagos state, Nigeria. *Global Journal of Science Frontier Research Chemistry* 13 (1), 7–12.

Federal Republic of Nigeria [National Bureau of Statistics] 2009 *Annual Abstract of Statistics 2009*. National Bureau of Statistics, Abuja.

Galadima, A., Garba, Z. N., Leke, L., Almustapha, M. N. & Adam, I. K. 2011 Domestic water pollution among local communities in Nigeria – causes and consequences. *European Journal of Scientific Research* **52** (4), 592–603.

Ibiyemi, A. O. 2008 Economics of solid waste management in Lagos state. *The Yaba Journal of Environmental Studies* **2** (1), 76–84.

Idowu, O. B. A., Omirin, M. M. & Osagie, J. U. 2011 Outsourcing for sustainable waste disposal in Lagos metropolis: case study of Agege Local Government, Lagos. *Journal of Sustainable Development* **4** (6), 116–131.

Kola-Olusanya, A. 2012 Impact of municipal solid wastes on underground water sources in Nigeria. *European Scientific Journal* **8** (11), 1–19.

Lagos State Government [Lagos Bureau of Statistics] 2005 *Abstract of Local Government Statistics*. Ministry of Economic Planning and Budget, Lagos.

Lagos State Government [Lagos Bureau of Statistics] 2012 *Abstract of Local Government Statistics*. Ministry of Economic Planning and Budget, Lagos.

Lagos State Water Corporation 2013 Facilities. http://www.lagoswater.org. Accessed 11/7/2013.

Lagos Waste Management Authority 2011 *LAWMA dump report*. http://www.lawma.gov.ng/landfilldata/LANDFILL%20REPOTS%20FOR%20THE%20OF%20APRIL.pdf. Accessed 12/7/2013.

Longe, E. O. & Balogun, M. R. 2010 Groundwater quality assessment near a municipal landfill, Lagos, Nigeria. *Research Journal of Applied Sciences, Engineering and Technology* **2** (1), 39–44.

Longe, E. O., Omotoso, O. B. & Sodamade, G. A. 2009 Appraisal of water supply facilities in rural riverine coastal areas of Lagos state. *Journal of Sustainable Development in Africa* **11** (1), 268–279.

Moe, C. L. & Rheingans, R. D. 2006 Global challenges in water, sanitation and health. *Journal of Water and Health* **4**, 41–57.

National Population Commission 2009 *2006 Population and housing census of the Federal Republic of Nigeria: Priority Tables (Volume I)*. NPC, Abuja.

Odewumi, S. G. 2013 Private sector participation model in waste management for developing countries: framework from Lagos study in Nigeria. *Global Journal of Human Social*

Science Geography, Geo-Sciences, Environmental and Disaster Management **13** (3), 31–34.

Oguntona, T. S., Adedeji, O. O. & Martins, O. C. 2012 Contamination of sachet water produced within industrial area of Ikeja, Lagos, Nigeria. *Transnational Journal of Science and Technology* **2** (10), 69–74.

Okoye, C. O., Onwuka, S. U. & Obiakor, M. O. 2010 Pollution survey in the Lagos Lagoon and its environmental consequences: a review. *Tropical Built Environment Journal* **1** (1), 41–57.

Olaleye, O. N. 2011 Detection of faecal coliforms in biofilms of water tankers in Odogunyan, Ikorodu – A peri-urban Lagos settlement. In: *Proceeding of the Environmental Management Conference*, Federal University of Agriculture, Abeokuta, Nigeria, 2011, 459–464. http://www.journal.unaab.edu.ng/index-php/COLERM/article/download/276/259. Accessed 10/07/2013.

Omalu, I. C. J., Eze, G. C., Olayemi, I. K., Gbesi, S., Adeniran, L. A., Ayanwale, A. V., Mohammed, A. Z. & Chukwuemeka, V. 2010 Contamination of sachet water in Nigeria: Assessment and health impact. *Online Journal of Health and Allied Sciences* **9** (4), 15, http://www.ojhas.org/issue56/2010-4-15.htm. Accessed 11/07/2013.

Omole, D. O. & Isiorho, S. 2011 Waste management and water quality issues in coastal states of Nigeria: The Ogun state experience. *Journal of Sustainable development in Africa* **13** (6), 207–217.

Oyegoke, S. O., Adeyemi, A. O. & Sojobi, A. O. 2012 The challenges of water supply for a megacity: A case study of Lagos metropolis. *International Journal of Scientific & Engineering Research* **3** (2), 1–10.

Oyeniyi, B. A. 2011 Waste management in contemporary Nigeria: The Abuja example. *International Journal of Politics and Good Governance* **2** (2), 1–18.

Taiwo, A. M., Olujimi, O. O., Bamgbose, O. & Arowolo, T. A. 2012 Surface water quality monitoring in Nigeria: Situational analysis and future management strategy. In: *Water Quality Monitoring and Assessment* (K. Voudouris ed.). InTech, China. http//www.intechopen.com/books/water-quality-monitoring-and-assessment/surface-water-quality-in-nigeria-situational-analysis-and-future-management-strategy.

United Nations 2010 *Human Development Report 2010: The real wealth of nations – pathways to human development*. UNDP, New York.

United Nations, Department of Economic and Social Affairs, Population Division 2012 *World Urbanization Prospects: The 2011 Revision*, CD-ROM Edition. United Nations, New York.