REVIEWED PAPER

33rd WEDC International Conference, Accra, Ghana, 2008

ACCESS TO SANITATION AND SAFE WATER:
GLOBAL PARTNERSHIPS AND LOCAL ACTIONS

Exploring implications of urban growth scenarios and investments for water supply, sanitation, wastewater generation and use in Accra, Ghana

D. J. Van Rooijen & P. Drechsel, Ghana

Large cities in developing countries are challenged to meet steeply water demands and to dispose of wastewater safely in a context of urbanisation and poor water management and planning capacities. Urban water management has direct implications for water availability and sewage disposal in terms of quality and quantity. Studying the future implications and assessing the scale of impact of these processes starts with an understanding of the various water flows, supply and sewage infrastructure and uses of the water that is supplied to the city. It is argued that changes in water infrastructure and household water use and sanitation facilities at the city level has implications for upstream supply and demand management and downstream wastewater management. This paper explores this research area with a focus on Accra in Ghana. It is argued that the current situation in Accra shows a need and potential for improvement of water supply and wastewater treatment, however, through ways that do not require more concrete pipes.

Drawing the context

Water is a basic resource and a necessity for human life. Water is a basic need for all human beings for direct consumption and food production. Regarding human hygiene, water is required for cleaning of the body. A secondary order water need comes with sanitation when excreta are disposed of with flushing. For all these needs, a specific daily minimum volume and quality of the water is required simply for survival and secondly to minimize health risks. The size of health risks depend strongly on the quality and quantity of wastewater and the probability of human contact with it. Environmental degradation and the over-exploitation of our water resources have created a situation of environmental problems and water scarcity that is expected to worsen with further population growth.

At present in developing countries, the conventional water and sanitation infrastructure does not cover the whole urban area. To improve water provision and wastewater disposal, the construction or improvement of the physical water supply and waste disposal infrastructure is a necessity. History has shown that economic development goes to some extent side by side with improvement of the water supply and sewerage network, but often with a fair delay of the latter. As water supply and sewerage systems improve, more per capita water is demanded and if increased demand is met to any extent, more wastewater is generated. The bigger question arises of what the impact is of changes in water and sanitation infrastructure on the dimensions of wastewater-agriculture, supply-demand proportion and quality of water bodies across the urban-rural interface.

Factors determining the development of water and sanitation infrastructure

In a context of urbanization and water scarcity and often a lack of financial resources, especially urban agglomerations in the lesser developed part of the world are facing huge challenges to fight problems that relate to water and sanitation. The factors that contribute to the scale of this challenge are shortly discussed below.

Data reliability

The quality of water and sanitation (watsan) infrastructure in an area is an important indicator of its phase in economic development. The quality of watsan is commonly expressed as a percent coverage of adequate water supply and sewage infrastructure. However, different interpretations go around on what is adequate.

Also, the level and quality of watsan services is 'politically charged', which makes it prone to data and definition use that do not reflect the real situation. This is a serious difficulty when assessing current situations of water provision and sanitation in the lesser developed world. Evidence for inaccurate statistics comes from comparisons of official data on urban provision with detailed city case studies (UN HABITAT, 2001). 'Objective' city case studies can indicate the reliability of these data and provide more accurate and reliable data in return. Watsan-data are important as they are used by governments, NGO's and donors to support their policy agendas for development and development aid related to water.

Urban governance

Governors of cities face great difficulties with providing water as a basic resource to their fast growing population. The urban water situation is complex and problems relate strongly to each other. A high fraction of physical water losses in the distribution system and a high non-revenue fraction due to un-metered connections cause a poor return flow of money. The poor state and low water pressure in water distribution systems and open or closed sewerage networks can cause seepage of sewage water into urban water bodies or even into potable water pipes, creating direct health risks to consumers. A problem witnessed in Accra is the contradiction between of political boundaries and actual urban area based on population density. This difference can be significant, impacting the quality of provision of water and sanitation services. Urban water governors cannot be held accountable for providing water and other services as this urban area of expansion is not within their authority. Residents in areas of urban expansion depend on alternative sources like wells, boreholes, tankers or remote standpipes. The cost, reliability and quality of water from these sources differ significantly from water supplied from the piped network.

Population growth

Urban growth is not necessarily a problem in itself; however, other problematic processes in a causal net related to urban growth can make it a problem. Existing services for water, energy and transport usually worsen when population densities increase. Meeting basic human demands in urban areas of expansion is a difficult task. Planners and governors in Accra are not capable of keeping pace with an unregulated rapid urban expansion they are confronted with. Keeping the infrastructure coverage up with the expansion of the urban area has not been managed and is an unrealistic target.

The context in Accra

Located in Ghana at the coast, Accra is exposed to high population growth and urban sprawl on the outskirts of the city. A population doubling time in less than 16 years between 1984 and 2000 is impressive, when Accra grew from 1.3 to 2.9 million inhabitants (GSS 2005). Current population would almost have reached 4 million, when using a likely growth rate of 4.4% for the Greater Accra Region. This population growth is also reflected in extension of the urban area; from 225km^2 (Accra municipal area) to an estimated 500 km^2 (Yankson et al. 2004), which is considered real urban area, disregarding political boundaries. The water supply system covers 36% and 14% respectively of the municipal and real urban area. The management of water supply is separated from sewage management. According to GSS (2005) in figure 2, of all households in the Greater Accra Region, an estimated 36% has a connection in the house and 46% has pipe born access outside the house. The latter number can also imply a shared tap in the street. The 7% tanker supply is expected to be much more. The remaining 11% use boreholes, wells, streams and other sources of water, whose water quality is disputable and unsafe.

Sanitation and wastewater

The few present treatment plants that Accra has are generally not in operation. The sewage network expands over 15% of the municipal area and has seen very little extension since its construction in the early 1970's (AFDB 2005). The higher income areas have septic tanks installed as onsite treatment facility. The effect of neglect and poor maintenance of the sewage system has led to an increase of pollution of the surface waters (and possibly groundwater) in the city and associated human health risks. A clear showcase is the Korle Lagoon, a natural estuary that drains water from the Odaw River into the ocean. What use to be an ecologically high value area and source of economic activity, fishery, has now become an open sewer draining pitch black water into the ocean. Siltation of the lagoon and vegetative growth have decreased its flood water carrying capacity, causing more intense flooding during heavy rains, worsened in periods of high tide (Karikari et al. 2006). A proposal prepared by the African Development Bank has planned to extent the sewage system and two new treatment plants to "cover the 2020 design horizon" (AFDB 2005). The current status of this initiative is not known.

A variety of different sanitation practices can be found in the Greater Accra Region (see figure 1). 32% of the population is using a flush toilet. However, the part of users that may have a WC that is out of service may be significant. From public toilet use (one third) it is not clear how its sub-categories are quantified. Field trips showed common sights of pit latrines that dispose directly into gutters (as in figure 3). These toilets may be flushed regularly with a piped connection or buckets. In the sanitation figure, at least 44% use an improved water source. The actual number is difficult to estimate as on the ground use of facilities and its features may differ substantially from the statistics. The volume of generated wastewater is estimated at 100,000 m^3 day^{-1} (Abraham et al. *unpublished*). The 5% of the wastewater that is collected in the sewage system ends up directly in the ocean as existing treatment plants are not in operation. A small part of the wastewater is being used for irrigation of mostly vegetables on an area of 740 ha. (Obuobie et al. 2006). This water is usually a mixture of untreated domestic wastewater and storm water. It is not known how much wastewater is disposed of into the ocean. One fraction is collected from septic tanks, transported with tanker trucks and emptied to a spot called 'Lavenda Hill', where it runs straight into the ocean (see figure 4). The balance is pumped through a pipe from a recently built dam that prevents the wastewater from the drains to enter the Lagoon. This project aims to prevent further pollution of the lagoon and to diminish coastal pollution as the pipe outflow is at a considerable distance from the coast.

Possible future developments of water and sanitation in Accra

In the light of urban development, any change of the current watsan situation will change the dimensions of water flows upstream, within and downstream of the city. A change of the current situation will not only affect its urban users but also users at other scales and sectors. Urban and peri-urban farmers in Accra rely on wastewater as an important source of irrigation. Any change of the wastewater flow pattern will affect their practices. Improvements in wastewater treatment will affect water quality and nutrient flows, both important factors for agricultural production downstream. Changing views and measures for storm-water management may also change urban water flows and affect downstream re-use. Institutional regulation and policy are potential factors that may change the way water and wastewater is being treated in the city.

Population growth and improvement of the water and sanitation infrastructure at city and household level will change the dimensions of water flows of supply and wastewater. Water use patterns at the household level dependent on the availability and quality of water supply. Urban population growth rate scenarios will be used to forecast future urban domestic water demands for Accra. Scenarios for changes in per-capita water use and wastewater generation as a result of changing water supply infrastructure and household facilities will be the subject of further studies on water in Accra.

Opening windows of opportunity for water supply, wastewater and sanitation in Accra

The previous discussion has pointed out that Accra has much scope for improvement of urban water management and planning. The piped water supply infrastructure only covers a small part of Accra and those without direct piped access rely on alternative ways of supply like tankers and smaller water vendors. A cost benefit analysis of extension of the piped network versus measures that improve services should be carried out, given the current shortcomings of piped water supply, especially in the fringes of the urban area. The analysis should include sustainability parameters and water demand estimates.

The potential for rainwater harvesting at household is there. It would diminish urban floods and associated damage and health risks in periods of heavy rainfall. It would also increase household water security, provided that the quality of rainwater allows a limited set of uses like sanitation or gardening. A cost benefit analysis should be carried out to explore the potential of rainwater harvesting in Accra.

Wastewater irrigation in Accra should be improved by health risks minimization and a more pro-farmer legislation for wastewater irrigation. In the context of water scarcity and the nutritional value of wastewater, options for scaling up wastewater irrigation should be explored. Downstream re-use is confined to the urban area due to Accra's location at the coast, but it could be viable to transport wastewater to areas where it can be used for irrigation. Given the poor functioning of western-style treatment plants, alternative methods like natural treatment or on-site treatment are more appropriate for the future of Accra.

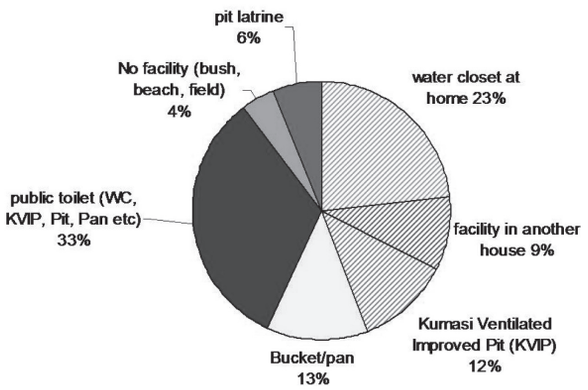

Figure 1. Breakdown of sanitation by facility in use in the Greater Accra Region in 2000.

Source: GSS (2005)

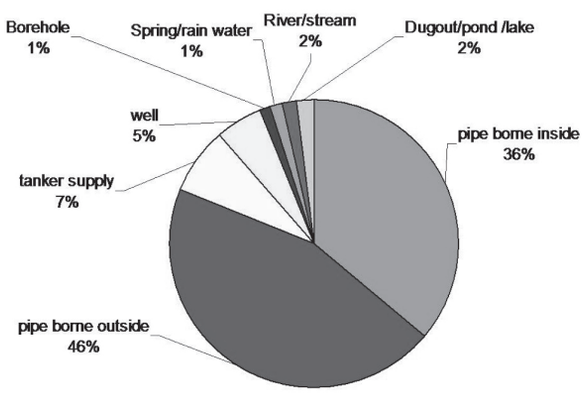

Figure 2. Breakdown of domestic water use by source in the Greater Accra Region in 2000.

Source: GSS (2005)

Figure 3. Public toilet at Tema bus-station in Accra

Source: Niklas Stoll

Figure 4. Discharge of wastewater from septic tanks into the ocean at Lavenda Hill in Accra

References

Abraham, E. M., D. J. Van-Rooijen, et al. (unpublished). *Review on urban water resources and water demand for urban agriculture and other livelihoods opportunities in Accra*. Accra, International Water Management Institute.

AFDB (2005). *Accra Sewerage Development Project. Summary report of the environmental and social impact assessment*. African Development Bank, Accra.

Huibers F. P.; Raschid-Sally, Liqa.; Ragab, R. (Eds) 2005. *Special issue of the Journal of the ICID on Wastewater Use in Irrigated Agriculture – The Water Chain Approach*. Irrigation and Drainage, 54 (Supplement 1): S1-S2.

GSS (2005). Population and Housing Census 2000, *Analyses of data and implications for planning Greater Accra Region*, Ghana Statistical Service: 106.

Karikari, A. Y., K. A. Asante, et al. (2006). "*Water Quality Characteristics at the Estuary of Korle Lagoon in Ghana*." West African Journal of Applied Ecology 10: Jul-Dec 2006.

Obuobie, E., B. Keraita, et al. (2006). *Irrigated urban Vegetable Production in Ghana. Characteristics, Benefits and Risks. Accra*, CSIR-INSTI, Printing Division.

Scott, C. A., N. I. Faruqui, et al. (2004). *Wastewater use in irrigated agriculture. Management challenges for developing countries*. Wastewater use in Irrigated agriculture. Confronting the livlihood and environmental challenges. C. A. Scott, N. I. Faruqui and L. Raschid-Sally, CABI/IWMI/IDRC 2004: 206.

UN-HABITAT (2001). *Cities in a globalizing world: Global report on human settlements 2001*.

Keywords

urbanisation, wastewater, sanitation, water supply, Accra

Contact details

D. J. Van Rooijen & Dr. P. Drechsel
International Water Management Institute
PMB CT 112, Cantonments
Accra, Ghana
Tel: +233-(0) 21 784753-4
Fax: +233-(0) 21 784752
Email: d.vanrooijen@cgiar.org/p.drechsel@cgiar.org
www: www.iwmi.cgiar.org