SWITCH

Sixth Framework Programme (2002-2006)

018530 - SWITCH

Sustainable Water Management in the City of the Future

Integrated Project
Global Change and Ecosystems

D6.3.1: Situational Analysis Social Inclusion (M12)

Organisation name of lead contractor for this deliverable: IRC International Water and Sanitation

Period covered: from M1 to M60
Start date of project: 1 February 2006
Project coordinator name:
Project coordinator organization name: **UNESCO-IHE**

Date of preparation: January 31, 2010
Duration: 60 months
Carol Howe
Revision [**final**]

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	PU
PP	Restricted to other programme participants (including the Commission Services)	
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CO	Confidential, only for members of the consortium (including the Commission Services)	

SWITCH Briefing Note Social Inclusion Situational Analysis
Audience The audience of the situational analysis were SWITCH partners involved in SWITCH-related activities in Accra and Alexandria. In addition, the documents have provided inputs into ongoing planning processes and demonstration projects in Accra and Alexandria.
Purpose The purpose of the situational analysis is to get a better understanding of the social inclusiveness of WASH-services in Accra and Alexandria. Secondly, the studies provided insight in the mechanisms that exclude certain groups from WASH services..
Background Social exclusion is the result of a complex set of factors. Moreover, excluded groups are often found in different locations in the city. These questions need to be answered before WASH services can be planned for and delivered in social inclusive manner.
Potential Impact The potential impact of these study are (a) more socially inclusive demonstration project both in Alexandria and Accra (b) more socially inclusive strategic planning processes in Alexandria and Accra.
Issues The main issues are up take at scale of the study findings outside the SWITCH consortium. Experience shows that more social inclusive WASH services are difficult to realize as it requires drastic and long-term changes of policies at different levels as well as innovative implementation practices.
Recommendations The most important recommendation for other projects is to invest resources to create a good understanding of issues related to social inclusion before the start of the planning and implementation process.

Situational Analysis - Social Inclusion

Accra and Alexandria

Overview Contents

Summary

The outcomes of the 4 studies are summarized in this PowerPoint presentation. The format is chosen to increase accessibility of the summary.

The summary presents:

- Main conclusions
- Main findings Accra
- Main findings Alexandria
- Conclusions.

Accra

The Accra situational analysis in Accra consists of two parts. The first part of the analysis was done at the city level and was done as part of the strategic planning process. This study carried out a Resource – Infrastructure – Demand – Access (RIDA) analysis for WASH services with a specific pro-poor focus.

The second part of the study carried out a detailed analysis of the exclusion mechanisms at the neighbourhood and family level. Guiding questions were: (a) where does you live (b) what does you have (c) who are you (d) what do you know.

Alexandria

Similar to Accra, the situational analysis in Alexandria consists of two parts. The first part of the analysis was done at the city level and was done as part of the strategic planning process.

The second part of the study was carried out at the site of the Alexandria demonstration projects and the outcomes of the study were used for the design of the demonstration project. Similar guiding questions were used as in Accra.

Main Conclusion

There is a range of mechanism that exclude people from sanitation, water, and flood protection. These can be found at all levels – the devil is often in the detail.

Mainstreaming groups needs a thorough understanding and a dedicated effort.

Social inclusion cannot be stand alone project but needs to be cross-cutting issue in other intervention.

Accra

Water Supply

- 56% of the population has indoor piped connection – only 28% of the poor have such connection.

- The better off pay 0.66 GH¢ per m^3; the poor pay between 3 and 11.6 GH¢ per m^3

Sanitation

- 54% of population has access to WC (with sewer connection) or KVIP; 46% has not access to improved facilities. Observations seems to suggest differently.

- WC and KVIP costs 0.75 and 6 GH¢ per month – unimproved facilities between 7 and 48 GH¢ per month

Alexandria

- Water coverage is almost 100% but sanitation coverage is lagging behind.
- Exclusion mechanism are mostly related to status of the area (informal settlements) and income.
- The study in the demonstration area points to problems around waste water drainage and deterioration of natural environment.

Social Exclusion

Social exclusion is not the same as poverty! Factors such as:

- Who you are (gender, ethnic background, religion)
- What you have (assets)
- Where you live (illegal settlements, proximity to networks)
- What you know (access to information)

Have been recognized to determine your well-being

Accra

Accra

- The Greater Accra Metropolitan Area covers an area of 1262 km sq. And has population of 2.7 million (census 2000). In 2030, Accra will have between 7.3 and 16.3 million inhabitants.

- 27% of the population is classified as poor or very poor – that it they earn less than 25% of the average national income.

- 54% of the population lives in compound housing and 46% of the population lives in rental accomodation.

Accra – water supply

- Water in Accra is provided through a range of service providers:
  - Ghana Water Company Ltd. Predominantly piped water supply
  - Private vendors – tanker operators, water vendors, and sellers of water sachets
  - Some community managed systems
  - Some self-service provision

- Higher and middle income
  - Mostly piped water connection
  - Installed overhead tanks to cope with water shortage and store water brought by tankers.
  - Installed booster pumps to cope with low pressure.

- Low income
  - Water vendors and public stand post
  - No coping mechanism and no limited storage place
  - Only 28% have piped connection

Accra Water Suppy

Source	% of population	Costs (GH¢/m³)
Household connection	51.2%	0.66 – 1.66
Vendor	37.7%	3.00 – 11.5
Tanker Service	1.3%	5.17-7.20
Sachet Water	8.6%	67 - 100
Self Supply	1.3 %	No data available

- The table above shows that the poorer section of the Accra population is paying for their water supply.

Accra - Sanitation

- Most sewage ends up untreated in the environment as only very few treatment plants work. Places where the pollution ends up tend be places where nobody want s to live.

- The sewerage network predominantly cover the economic better-off areas.

- Holes in the urban sanitation chain are plugged by people that find employment that nobody else wants. For instance, people collecting night soil, sewerage workers, manual pit emptying, etc.

Accra Sanitation

Sanitation Facility	% of population	Costs month
WC with sewerage	33.2%	4.6 – 6.0
Pit Latrine	20.8%	0.75
Public Latrines	41.3%	7.50 - 22
Bucket latrine	3.2%	48
Open defecation	1.1%	No data available

- The table above shows that the poorer section of the Accra population is paying for access to sanitation services.

Accra – storm water management

- Urban flooding is serious problem in Accra and affects the low lying area where the poor live.

- Storm water drainage is also the main source of irrigation water for urban agriculture in Accra.

Exclusion mechnasims

There are a number of mechanisms that exclude certain groups for adequate access to urban WASH services. These mechanisms are found at city, neighbhour hood, and family level. The RIDA analysis and the institutional mapping (work package 6.1) identified the following mechanisms at **city level**:

- regulations (Ghana Water only considers people with connection their clients.
- Status of poor settlements – no security of tenure
- Low social and political capital.
- Technology choice – WB opted for water born sewerage and covers mostly high and middle income areas.
- Block tariffs makes water more expensive in compound housing

Social Exclusion

The study carried out in Thesie and Mamobi-East investigated the access to basic WASH services and exclusion mechanisms with the households and neighbourhoods.

Access to services

The studies at neighbourhood level confirm the findings of the RIDA analysis. Importantly, it shows that the availability of public/community latrines does not mean that people have access to them. Costs, safety, queues, and opening hours limit the actual use of these latrines.

Flooding is a serious problems in specific low-lying locations. These floods go mostly unnoticed in the local media.

Exclusion mechanisms

Neighbourhood level

- Cartel of water vendors and local (political) leaders
- Parallel power structure of local chiefs – new comers are disadvantaged

Household/individual level

- Gender – women cannot inherit property
- Families lack capital to invest in water storage or connection

Alexandria

Exclusion mechanisms

National Background

- Egypt's urban population is rapidly increasing. An increase of 6 million between 1996 and 2006

- There are 10 ministries involved in the provision of drinking water; the government seeks to increase the role of the private sector in the sector.

- Around 96% of the population is connect to the water supply network. Though certain groups such as people living in illegal settlements tend to get excluded.

- The drinking water sector has an operation deficit of US$ 1 billion and a debt of US$ 1.5 billion with the national development bank.

Alexandria

- Population fluctuates between 4.1 (winter) and 6.1 (summer) million people. Population doubled in the last 30 years.

- Densities vary between 11 thousand and 132 thousand per square kilometre.

- In 1996 About 800 thousand people (25% of population) live in informal settlements : in 2006, 1.4 million people (41.8% of population) live in informal settlements.

Alexandria

- The government has undertaken extensive action to upgrade these informal areas.
- Around 97.5% of the population has access to potable water.
- However, getting a household connection is difficult for the poor as:
  - High connection fees that need to be paid a lump sum
  - Need to show proof of ownership to get a house connection.

Alexandria Sanitation

- Sanitation and sewage is lagging behind compared to water supply.
- Around 13% of the population is not connected to Sewerage network most of these people live in informal areas.
- Floods and poor drainage is an additional problems

Social exclusion in demonstration site

In addition to the side wide situational analysis, a more detailed study was carried out in the area where the demonstration project would be carried out. This study was part of the feasibility study that was carried out to support the design of the demonstration project.

Main characteristics of study area (Maw'a El-Sayadeen):

- Population - 80,000 living on 37.5 acres
- Sanitation and water services mostly through self provision and community efforts
- Large differences in income and quality of the living environment within the three areas.

Social exclusion in demonstration site

Water quality

- The deterioration of water quality of Lake Mariyut forms a major threat to the livelihoods of the fishermen

- Main problems related to the access to services such as water supply, drainage, sanitation, and electricity.

    - Around 5% of the population has not access to household water connection
    - Major problems with quality and maintenance of sewerage systems resulting in frequent flooding of streets.
    - No solid waste disposal

Social Inclusion

- The location and the informal status of the are important factors that contribute to the poor level of services.
- Households have limited physical, financial and human capital and their natural capital is under threat. The residents depending on the Lake for their livelihoods are highly vulnerable to income fluctuation and decline due to the deterioration in Lake Maryut.
- The gender roles are changing as more and more women need to work to contribute to the household income.
- Women were able to participate in discussions on WASH services

- The community has strong relationships outside the community; within the community relationships are mostly based on families ties.

- Strong willingness to participate in community activities but the limited resources are an important constraint.

Towards integrated urban water management in the Greater Accra Metropolitan Area

Current status and strategic directions for the future

Marieke Adank, Bertha Darteh, Patrick Moriarty, Henrietta Osei-Tutu, David Assan, Daan van Rooijen

SWITCH / RCN Ghana
2011

This (product) has been prepared within the framework of the European research project SWITCH. SWITCH is supported by the European Commission under the 6th Framework Programme and contributes to the thematic priority area of "Global Change and Ecosystems" [1.1.6.3] Contract no 018530-2.

Published by: Resource Centre Network, Ghana
P.O Box CT 6135
Cantonments, Accra, Ghana
Tel: +233 302 769530 / 769552
Email: rcnghana@gmail.com

Editing: Cheryl White

Cover design & printing: Combert Impressions
Tel: +233 302 240557 / 253044 / 0243 690048

ISBN: 978-9988-1-4828-7

Adank, M., Darteh, B., Moriarty, P., Osei-Tutu, H., Assan, D., Rooijen, D. van (2011) *Towards integrated urban water management in the Greater Accra Metropolitan Area, Current status and strategic directions for the future*, SWITCH/RCN Ghana, Accra, Ghana

Key words: Urban, integrated urban water management, Accra, water supply, sanitation, storm water drainage, planning, governance

You can download a free copy of this publication from:
http://www.switchurbanwater.eu/

Executive summary

Accra is the administrative, political and commercial capital of Ghana. Providing water and sanitation services to all in a fast growing, largely unplanned city like Accra and managing water in an efficient and integrated way, is a huge challenge. This document presents the results of the contribution of the SWITCH project to the development of a strategic plan for integrated urban water management for the city of Accra to address this challenge. This takes the form of the definition of a vision for water management and water related services in the city of Accra of the future, a comprehensive situational analysis, and strategic directions for going from the current situation towards the vision.

The city of Accra and its population

The city of Accra, the capital city of Ghana, used to be synonymous with the Accra Metropolitan Area. However, in the last two decades, the city has sprawled beyond these boundaries. Today, the city of Accra covers an area generally referred to as the Greater Accra Metropolitan Area (GAMA), consisting of the Accra Metropolitan Area (AMA); the Ledzekuku-Krowor Municipal Area; the Tema Metropolitan Area (TMA) ; the Ashaiman Municipal Area; the Adenta Municipal Area; the Ga East Municipal Area; the Ga West Municipal Area; and the Ga South Municipal Area.

In the year 2000, the population of this area was 2.7 million inhabitants. Taking into consideration different growth rate scenarios, the 2007 population of the Greater Accra Metropolitan Area (GAMA) can be estimated to be between 3.4 million and 3.9 million people. Considering these different growth scenarios, estimates for the 2030 population of GAMA range between 7.3 million and 16.3 million inhabitants. Infrastructural development within the city has to a large extent taken place in an unplanned way. Within Accra, a number of different types of social-economic zones can be identified. High density indigenous areas are mainly located along the coast, while high density low class areas are more scattered over the Greater Accra Metropolitan area. Middle density indigenous areas can mainly be found in the older residential areas within the AMA area, middle density middle class areas in central Accra and in the Ga and TMA areas and low density high class areas can mainly be found in eastern AMA, but also in some Ga areas and TMA. The majority of the population (54 percent) of GAMA lives in compound houses and many households rent (46 percent) rather than own the house they live in.

Vision and scenarios

Accra City Stakeholders, brought together in the Accra Learning Alliance, have defined an integrated urban water management vision for Accra 2030 as follows:

- There will be 100 percent access to uninterrupted water supply
- Water quality will meet Ghana Standard Board criteria
- Non revenue water (due to physical and commercial losses) in the GWCL system will amount to 20-25 percent
- There will be improved productive uses of water for livelihoods (micro enterprises and agriculture)
- 80 percent of Accra's citizens will practise good sanitation behaviours and willingly pay for waste management. This will have led to a 70 percent reduction in water and sanitation diseases
- At least 80 percent of Accra's citizens will have access to an acceptable level of sanitation facilities

- Integrated solid waste management (collection, transport treatment and final disposal) of solid waste in a sustainable way. Collection of solid waste will be 90 percent. Accra will separate its solid waste
- Accra will be a cleaner city with good drainage systems

To aid in the identification of robust strategies to achieve this vision, a number of narrative scenarios of possible future trends in water resource availability, population growth and demand and governance have been developed.

The scenarios have been defined as follows:

Worst case scenario
Accra in 2030 is a depressing, chaotic and crisis prone town, with a population of more than four times its 2007 level and a water demands almost six times higher than the actual capacity of the water supply system in 2007. Lack of effective political leadership, coupled with poor economic performance and severe poverty mean a lack of ability to tackle deep-seated problems of under-investment and poor management of water supply and sanitation infrastructure. These problems are made worse by lack of raw water resources due to increased competition and a reduction in river flows.

Medium case scenario:
Accra has grown to almost three times the population in 2007, fueled in part by strong economic performance based on oil wealth. This has led to sharply increased demand for water. This demand is augmented by the rapid growth in the tourism and manufacturing sectors. However, while rapid, this growth has not been chaotic – due in large part to the marked improvement in political culture and related enforcement of planning laws and other regulations. Climate change (and competition for water from outside the city) has led to a modest reduction in overall water resource availability, which together with the strong growth in demand (four times what it was in 2007), presents major challenges. These are compounded by lack of access to finances and land for new infrastructure. However, improved management and capacities within both the utility (GWCL) and local government, new technological options and engaged and empowered citizens inspire confidence that solutions will be found.

Best case scenario:
Accra in 2030 is in many ways a blessed city. Contrary to the fears of many in the early 2000s, the city's population growth, while large, has been manageable (2.2 times 2007 levels). The frequent power shortages of the early 2000s are only a distant memory. A sharply improved political culture has led to improvements in enforcement of planning laws, whilst policy is seen as progressive. This, coupled with strong economic growth (partly driven by increasing oil wealth), has led to marked improvements in citizens willingness and ability to pay for water and sanitation services. Water demands have increased because of steady population growth and economic growth (three times as high as the capacity of the system in 2007). Challenges do exist. Overall water resource availability is reduced. It continues to be difficult to source the necessary financing to upgrade the city's infrastructure and access to land for waste processing facilities and new networks is a constant problem. Nevertheless, there is guarded optimism about the ability of the city to deal with these problems.

Water resources

Water resources in and for Accra include rainwater (average annual rainfall is about 756 mm with the main rainy period from March to July and a smaller rainy period from September to October), ground water resources (with an estimated total recharge of about 0.038 km^3/year) and surface water resources.

The population of Accra is to a large extent dependent on surface water for its water supply, which is imported from sources that lie outside the boundaries of the city: the Weija Lake on the Densu River and the Volta Lake on the Volta River, further afield from the city. The optimal safe yield from the Weija Lake is about 0.10 km^3/year. With an average annual discharge of about 43 km^3/year, the potential yield from the Volta is determined by the capacity of the intake and treatment infrastructure, rather than by the availability of water resources, even when considering a potential drop in river flow caused by climate change and increased use of water upstream in the basin.

Ground water is to a large extent too saline to be used for consumption, especially near the coast. The water quality of rivers and lagoons within the GAMA is below WHO and Ghana EPA standards, especially in the Odaw and the Korle lagoon.

Water supply services

A variety of water service delivery models can be identified in the Greater Accra Metropolitan Area with different sources of water providing different levels of water services. These include utility water supply services, private (intermediary and independent) water supply services and community managed water supply services. Households can rely on a mix of different service delivery models for their water supply.

The main source of water for AMA and TMA is the utility system, which produces almost 365,000 m^3 per day, about 99 percent of all water produced in GAMA. Although the utility, the Ghana Water Company Limited (GWCL) produces most of the water that is used in the Greater Accra Metropolitan Area, only about 51 percent of the population has direct access to utility water supply services. The rest depend on private and community service providers, many of whom get their water from the GWCL system, either directly (through a connection to the network) or indirectly (e.g. through tanker services). There is a variety of alternative service providers. Each provides different services in different areas at different costs per unit water, which are considerably higher than the costs per unit water charged for water supplied through household connections. A number of communities on the fringes of Accra are being served by systems independent from the utility system, including community-managed small town piped water supply systems implemented by the Community Water and Sanitation Agency (CWSA), and privately-operated and managed water supply kiosks, like the WaterHealth Centres which can be found in the northwest of Accra.

Challenges related to water supply in Accra are:

- The water demand is higher than the supply:
  The amount of water produced was between 71 percent and 81 percent of the water demand in 2007, which was estimated to be between 450,000 and 500,000 m^3 per day. The GWCL head works are working under their capacity (for the Kpong system, production was 88 percent of the capacity in 2007, while this was 83 percent for the Weija system). In the longer term, water demand is projected to increase considerably due to population and economic growth to somewhere between almost one million and 2,400,000 m^3 per day. Therefore, the capacity of the system(s) supplying water to GAMA will have to be substantially increased.
- The amount of non-revenue water in the GWCL system is very high:

Non-revenue water amounted in 2007 to about 60 percent of the amount of water produced. This was both due to physical losses (27 percent of the amount of water produced), as well as economic losses (33 percent of the amount of water produced). Physical losses in the system are caused by the bad state of the distribution infrastructure, aggravated by the limited leakage detection system. The bad state of the distribution infrastructure can be attributed to lack of maintenance, replacement and rehabilitation. This is likely to be (partly) caused by lack of financial resources available to GWCL because of high commercial losses, uneconomical tariffs and lack of investment by government and external donors in maintenance, replacement and rehabilitation. Causes of the commercial losses include inaccurate recording of customer meters, inaccurate data recording, estimation and use of flat rate water rates, ineffective revenue collection procedures and illegal consumption and connections. Illegal connections and consumption are influenced by a number of underlying factors. People struggle to get connected due to complicated procedures and legal boundaries. In order to get connected, proof of ownership has to be submitted to the utility. People living in rented houses, which is the majority of the GAMA population, are unable to do so and are therefore unable to connect. In addition, the connection costs are relatively high.

- The reliability of the GWCL system is very low:
  This is caused by unreliable electricity supply, lack of storage capacity in the distribution system and the fact that demand is higher than supply, resulting in rationing of the water supply. Reasons for the low supply are diverse. They include low system capacity, high physical losses in the distribution system, the stealing of water and the presence of in-line booster pumps which, according to GWCL/AVRL, disrupt the distribution of water in the system.
- A large part of the GAMA population depend on expensive alternative service providers:
  Because of the legal and financial barriers faced by the poor, it is mostly the wealthier strata of the population that is connected to the GWCL network, which enables them to profit from the considerably lower rates per unit of water than people who are not able to connect. The majority of people in the Greater Accra Metropolitan Area, especially the poor, depend on alternative water service providers. Rates charged by these alternative water providers are higher than the GWCL tariff. This is (partly) due to the extra costs the alternative service providers have to make in order to provide the service. Prices and quality of water provided by the alternative service providers is not regulated, as alternative providers are not formally recognised, registered and regulated.

In order to overcome these challenges, the following strategic directions have been explored by the Accra Learning Alliance:

- Decreasing demand though education, incentives, by-laws and possibly through tariff adjustments
- Improving GWCL water supply services:
  - Creating addition system capacity by expanding the treatment capacity of the GWCL system and exploring additional sources of raw water
  - Decreasing physical losses through rehabilitation of the distribution system, better operation and maintenance and active leakage detection, including bulk metering
  - Increasing GWCL revenues, through decreasing commercial losses (by further investments in customer meters and their ongoing maintenance, improvement of the billing management system, community awareness raising and education and active monitoring of the distribution system) and possibly through increasing the tariff

    - Improving access to GWCL system through innovative approaches for connecting the poor and acknowledging alternative approaches to providing water to people who are not able to connect to the GWCL directly, like standpipes and community-managed bulk water supply
- Lowering water prices for low income households, through special consideration in the water tariff for compound housing and recognition, registration and regulation of alternative service providers
- Improving access to water services for communities and households outside the reach of the GWCL network, though independent privately managed systems, community managed systems and self-supply (e.g. rainwater harvesting)

Excreta and wastewater services

Different sanitation service delivery models can be identified in the Greater Accra Metropolitan Area. Sanitation service providers can be broadly grouped into three categories: municipal service providers, private service providers and self-supply. The municipal providers include septic emptiers, servicing both private WCs as well as public facilities; the sewer system, with household and institutional connected WCs; and human waste transfer stations where human waste from pan and bucket latrines is collected. There are also private sector septic emptiers, servicing the same target group as the municipal septic emptiers. Finally, a number of people and institutions provide their own sanitation services. These include institutional sewer systems and on-site treatment sanitation facilities like pit latrines and KVIPs.

The main challenges related to sanitation in Accra can be summarised as:

- The vast majority of the waste treatment plants are not working:
  The two central sewer systems are not operational and of the 35 institutional treatment plants, only four are functioning. Most wastewater is disposed of in soak-away storm drains and by throwing it into the street or compound. Part of this water infiltrates and joins the groundwater resources and part flows to the sea through the storm drainage system. Most of this flows untreated into the ocean.
- There is a lack of treatment capacity:
  Even if fully functional, the current (2007) capacity for liquid waste treatment is far below the estimated wastewater production - only about 17 percent of the estimated amount of wastewater produced. As more water is supplied to the city, the production of wastewater will rise as well, increasing the need for safe collection, treatment and disposal of wastewater.
- The lack of use of safe and hygienic sanitation facilities:
  Although according to official statistics the percentage of people who practice open defecation or use unhygienic bucket or pan latrines is very low (4.3 percent), the presence of rubber bags containing human excreta, especially in the densely populated areas, seems to suggest that there still is a problem in this area. An important reason for people not using hygienic sanitation facilities is the fact that these facilities are not available in the house, because of lack of space, lack of willingness of landlords to provide sanitation facilities and /or lack of awareness and urgency. Public facilities are often not used because these are too far away, too filthy and/ or too time consuming to use, because of long queues.
- Many people depend on public sanitation facilities, paying more for access to lower level services than people with access to private sanitation services:
  Low income households generally do not have the space and resources to install a septic tank or (K)VIP. The level of sanitation services provided by the public latrines service varies but is

generally low. The number of public latrines is too small to serve the estimated 1.5 million people depending on these facilities, leading to long queues during the early morning and evening rush hours. The abolishment of pan and bucket latrines will increase the pressure on the public latrines. In addition to the problem of long queues to access the facilities, the sanitary condition of public toilets is generally poor. As with water supply, people connected to the central system pay less than people who are not connected. However, the number of people connected to the sewer system is extremely small.

To overcome these challenges, the Accra Learning Alliance explored the following strategic directions:

- Improving access to private sanitation facilities, which can be done through the enforcement of by-laws for the construction of household latrines, the facilitation of appropriate technology choice and awareness creation and education
- Improving public latrine services by increasing the number of public latrines, ensuring adequate water supply to public latrines and improving the management of public latrines
- Increasing the treatment capacity. Under the Accra sewerage improvement project, there are plans to extend the sewer system. However, even when fully successful, the impact of this intervention will be relatively small. Therefore, additional strategies are needed like securing, acquiring and maintaining sludge treatment sites; rehabilitating existing ones; and using natural systems
- Improving the use of existing treatment capacity by increasing the number of connections to the sewer system and by building the capacity of the sewerage unit staff.

Storm water drainage

Most of the drainage of storm water takes place though natural drains. In addition to the storm water, the storm drains handle a large part of the (grey) wastewater. The current capacity of these drains is not sufficient to handle the storm water, which leads to frequent flooding of certain areas within GAMA. Discharge through the storm drains is limited due to erosion, siltation and the collection of solid waste in drains. None of the drains in the Densu and Mokwe basin are lined and in the other basins, only part of the drains are lined or otherwise improved, like the Odaw drain.

The Greater Accra Metropolitan Area is developing and expanding. This development will result in increased 'sealing' of the soils in the upstream parts of the urban catchments. The loss of permeability will result in an increase in storm water flows in the southern part of the city, which is likely to increase the flooding frequency and the subsequent damage to infrastructure, the economy and will endanger human lives. The development of new urbanised areas in the northern part of the city in the coming years is likely to also result in an increase in grey and black wastewater generation. As large areas of the Greater Metropolitan Area become urbanised, urban farmers will find it more and more difficult to find land in the city to satisfy the city's demand for fresh vegetables.

The Accra Learning Alliance explored the following strategic directions to address these challenges:

- Improving storm water discharge by improving and maintaining the storm water drainage system and by ensuring drains do not become clogged by solid waste
- Reducing surface water run-off by applying Sustainable Urban Drainage Systems, developing and maintaining a green belt around the current built up area, where urban agriculture can be practiced and by promoting rainwater harvesting

Institutional coordination and planning

Institutionally the sector is fragmented, with overlapping areas of responsibility. There is poor-to-no enforcement of existing (planning) regulations and lack of frameworks for integrated planning.

In order to improve this situation, the Accra Learning Alliance suggested the following:

- Facilitation of a 'Greater Accra Metropolitan Area (GAMA) Integrated Urban Water Management Planning and Coordination Platform' for city wide planning alignment and development of water and sanitation services
- Resolution of ambiguities regarding the respective roles of the municipalities and Ghana Water Company Limited in providing water services
- Resolution of ambiguities on responsibilities for drainage
- Resolution of ambiguities regarding responsibilities for wastewater management at the local authority (Metro/Municipal Authority) level

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List of abbreviations

ADB	African Development Bank
AFD	Agence Française de Développement
AMA	Accra Metropolitan Assembly

ASIP	Accra Sewerage Improvement Project
ATMA	Accra Tema Metropolitan Area
AVRL	Aqua Vitens Rand Limited
AWP	Accra Waste Plant
CWSA	Community Water and Sanitation Agency
DRWH	Domestic Rainwater Harvesting
EPA	Environmental Protection Agency
ET	Evapotranspiration
GAMA	Greater Accra Metropolitan Area
GH¢	Ghana cedi
GSS	Ghana Statistical Services
GWCL	Ghana Water Company Limited
HSD	Hydrological Services Department
IRC	International Water and Sanitation Centre
IUWM	Integrated Urban Water Management
IWMI	International Water Management Institute
KNUST	Kwame Nkrumah University of Science and Technology
lpcd	Litre per capita per day
masl	Metre above sea level
MDG	Millennium Development Goals
PURC	Public Utility Regulatory Committee
RIDA	Resources, Infrastructure, Demand and Access
RCN	Resource Centre Network Ghana
SIP	Strategic Investment Plan
STP	Sewage Treatment Plant
SWITCH	Sustainable Water Improves Tomorrow's cities' Health
USD	United States Dollar
WHO	World Health Organisation
WMD	Waste Management Department
WD-MWRWH	Water Directorate of the Ministry of Water Resources, Works and Housing of Ghana

Acknowledgements

This document has been the result of a strategic planning process on integrated urban water management for the city of Accra, undertaken by the Accra Learning Alliance, within the framework of the SWITCH project. This process took place from the beginning of 2007 till the end of 2010.

The authors of this document would like to thank all members of the Accra Learning Alliance for their valuable contributions to this document. In particular, the authors would like to thank:

Ing. Charlotte Engmann (CWSA)
Prof. Mrs. Esi Awuah (KNUST)

Mr. Minta Aboagye (WD-MWRWH)
Mr. Kwaku Adjei (KNUST)
Mr. Stephen Ackon (WMD-AMA)
Mr. Wise Ametefe (HSD)
Major Awuah (WMD-AMA)
Mrs. Anne Barendregt (AVRL)
Dr. Charles Batchelor (IRC)
Mr. Anderson Blay (WMD-AMA)
Dr. John Butterworth (IRC)
Dr. Olufunke Cofie (IWMI)
Mr. Nicolas Dickinson (IRC)
Dr. Meine Pieter van Dijk (UNESCO-IHE)
Mr. Edwin Doodoo (Unihydro Ltd)
Dr. Sam Kayaga (WEDC)
Mr. Cor Lievers (AVRL)
Dr. Kwabena Nyarko (KNUST)
Mr. Timothy Oman (Planning Unit – AMA)
Dr. Liqa Rashid (IWMI)
Dr. Peter van der Steen (UNESCO-IHE)
Mr. Joep Verhagen (IRC)
Ms. Cheryl White
Mr. Abubakari Wumbei (RCN)

Finally, the authors would like to acknowledge the support of the Resource Centre Network Ghana for the printing and distribution of this document.

1 Introduction

Accra is the administrative, political and commercial capital of Ghana. It is the largest and fastest growing metropolis in Ghana. In addition to its residential population, Accra has a large fluctuating migrant population who come to trade or work for part of the year.

The city has been struggling to keep up with the booming population growth. Providing water and sanitation services to all in a fast growing, largely unplanned city like Accra is a huge challenge. A large part of the population is not connected the central water supply network and only a very small part is connected to the city central sewerage system. Also, many areas in Accra are prone to frequent floods, partially caused by the blockage of storm water drains by solid waste. The institutional framework is fragmented and ill-equipped to deal with the ever increasing complexity of managing urban water in Accra. While there are various plans and planning processes relating to different aspects of water management and sanitation within Accra, responsibilities are fragmented. The action of the various agencies responsible are not well coordinated, and often planners and operators are hampered by limited access to accurate data on key aspects to inform their planning, decision making and the monitoring of progress towards objectives.

In view of this, the SWITCH Project, through research and with the support of its Learning Alliance, explores options that will contribute to addressing these challenges to Integrated Urban Water Management and the provision of sustainable and affordable water and sanitation services to all in Accra. SWITCH is a large-scale EU research project that aims to promote a paradigm shift to achieve integrated urban water management - away from existing ad hoc solutions and towards a more coherent and integrated approach. The SWITCH project is made up of 33 partners from 15 countries. The project seeks to develop innovative and sustainable urban water management approaches, technologies and financing mechanisms. This is being implemented by the various partners through a combination of Research & Technological Development, Training and Demonstration activities within a Learning Alliance framework[1]. Accra is the only sub-Saharan African city among the SWITCH demonstration cities around the world.

Within this framework, SWITCH supports the development of a strategic plan for better and more integrated water management and service delivery in the city of Accra. Since different elements of the urban water cycle are closely interlinked, as illustrated by the figure below, this strategic plan should cover all elements of the urban water cycle, rather than focussing on a specific part of the urban water cycle. This document presents the results of the contribution of the SWITCH project to the development of a strategic plan, in the form of the definition of a vision for water management and services in the city of Accra of the future; a comprehensive situational analysis and analysis of future scenarios; and strategic directions for achieving this vision, taking into account the current situation.

1.1 Methodology: The Accra Learning Alliance and the strategic planning process

The support of the SWITCH Project to the development of an integrated strategic plan for water management and service delivery in the city of Accra followed the visioning, scenario building and

[1] A learning alliance is a multi-stakeholder platform made up of individuals or organisations with a shared interest in innovation aimed at breaking down barriers to information sharing, speeding up the process of uptake of innovation and scaling up of research outputs.

strategy development methodology, as developed under the EMPOWERS Project (www.empowers.info) and further developed for urban water management under the SWITCH project (www.switchurbanwater.eu). The first steps towards an integrated strategic plan for water management in the city of Accra were taken during the First Multi-Stakeholder Forum, held in March 2007, when stakeholders developed a draft vision for urban water management in Accra in 2030. The workshop brought together key stakeholders in urban water management such as: policy makers, regulatory agencies, researchers, consumer groups and representatives from local assemblies. Participants included the then mayor of Accra and the Minister of Water Resources, Works and Housing. This formed the basis of the Accra Learning Alliance.

This was followed by a visioning and scenario building workshop in August 2008 at which the vision was refined, the different scenarios of developments outside our sphere of influence were developed and broad strategic directions were proposed.

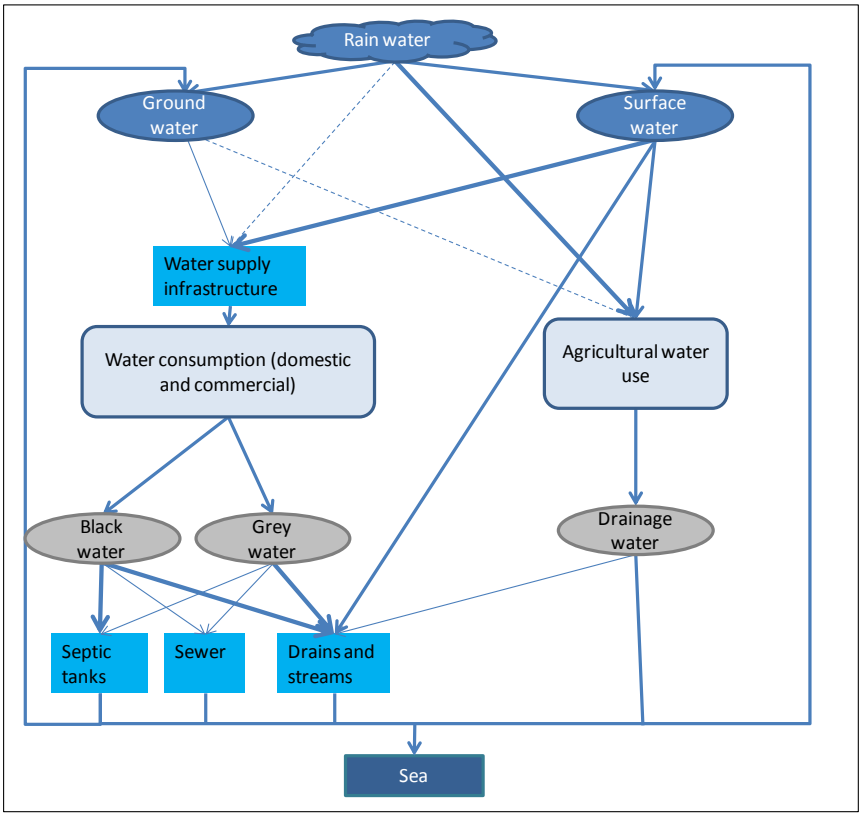


Figure 1: The urban water cycle

During the workshop, lack of information was identified by city-level stakeholders as one of the bottlenecks for the development of an integrated plan for water management in the city of Accra. Therefore, the SWITCH project facilitated a data collection and analysis exercise in between the different workshops. The objective of this exercise was to improve access to data and information and improve communication between and within stakeholder groups. The exercise used a RIDA (Resources, Infrastructure, Demand, and Access) framework for the collection and analysis of data and information. It provided background information for a data and information based strategic planning process for the city of Accra, by collecting, structuring and analysing information on water resources, water related infrastructure, demand for water supply, sanitation and storm water drainage services as well as the

actual access to these services in Accra. Data and information were collected though a review of literature, including grey literature, and a number of key stakeholder interviews.

A good start in compiling information was made by the development of the Accra Starter kit, a CD Rom containing data and information about key aspects related to integrated urban water management in Accra, compiled by IWMI and KNUST, under the SWITCH project. The data from the Accra Starter Kit and additional secondary information and data collected from, and with the help of, Accra Learning Alliance members was used to get a comprehensive picture of the current status of water management in the city of Accra and to build realistic scenarios of external factors the city will have to deal with in the years to come. An overview of the sources of data and information used can be found in Annex 1.

In addition to the RIDA analysis, an institutional mapping was done on urban water management in the city of Accra. Both the tentative RIDA and the institutional analysis were presented and discussed at the Accra Learning Alliance workshop in June 2009 and served as input for further discussions on strategic directions during the workshop. The strategic directions were taken further in the November 2009 Accra Learning Alliance meeting and were presented to the National Level Learning Alliance Platform. The strategic directions were finalised during the Accra Learning Alliance workshop on strategy building in January 2010, in which working groups worked on finalising the strategic directions around water supply; excreta and wastewater management; storm water drainage and flood control; and institutional coordination and planning.

This document presents the RIDA analysis with relevant parts of the Institutional Mapping report (Darteh, forthcoming) and the vision, scenarios and strategic directions for improving integrated urban water management and service delivery in the city of Accra, as developed by the Accra Learning Alliance. It intends to stimulate and serve as an input to the further development of an integrated plan for the management of water and the delivery of water related services in the city of Accra.

1.2 Outline of Report

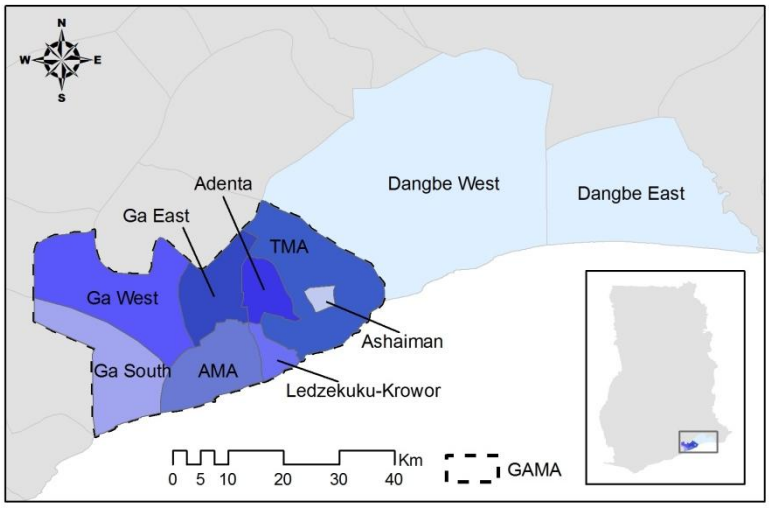
This report contains nine chapters. This first chapter has given the background and purpose of this document and its development. In the chapter that follows, the city of Accra, its institutional set-up and its population are presented. It includes a discussion on how to delineate the Accra urban area to define “the city of Accra” and how this will be used in this document. This is followed by chapter three, in which the vision for the city of Accra, as defined by the Accra Learning Alliance, is presented. This chapter also presents the scenarios which will have to be considered when looking for strategic directions towards achieving the vision. Chapters four, five, six and seven each deal with a specific part of the urban water cycle: water resources (chapter four), water supply (chapter five), excreta and wastewater management (chapter six) and storm water drainage and flood control (chapter seven). Each of these chapters describes the current situation regarding infrastructure, demand for water related services and actual access to these services and the barriers that people, especially the poor, face in accessing these services, including the costs of accessing these services. In addition, these chapters describe the current and future challenges and proposed strategic directions for reaching the vision, addressing the challenges. Chapter eight focuses on planning and coordination of water management in the city of Accra. Finally, chapter nine presents the main conclusions.

2 The city of Accra and its population

This chapter gives an introduction to the city of Accra, the capital of Ghana. In section 2.1, the city of Accra and its development are described. Section 2.2 presents the administrative set-up and in section 2.3 an introduction is given to Accra's population, both in terms of size as well as composition. A summary of the chapter is given in section 2.4.

2.1 Accra and the Greater Accra Metropolitan Area

The city of Accra is located in the Greater Accra Region, which is with 3,245 km^2 (GSS, 2005) the smallest region in Ghana. About 88 percent of the population of the Greater Accra region lives in localities defined as urban (settlements with a population of 5,000 or more) and only 12 percent lives in small rural communities. The region used to be divided into six administrative districts: Accra Metropolis (AMA), Ga West, Ga East, Tema Municipality, Dangme East and Dangme West. Currently, however, as shown in
Figure 2, the Greater Accra Region consists of the following:



- Accra Metropolitan Area (AMA)
- Ledzekuku-Krowor municipality (formerly under AMA)
- Tema Metropolitan Area (TMA)
- Ashaiman municipality (formerly under TMA)
- Adenta municipality (formerly under TMA)
- Ga East municipality
- Ga West municipality
- Ga South municipality (formerly under Ga West)
- Dangme West
- Dangme East

Figure 2: Greater Accra Region, Greater Accra Metropolitan Area (GAMA), and Accra Metropolitan Area (AMA)[2]

Originally, the "City of Accra" covered only the area under the Accra Metropolitan Assembly (AMA), covering an area of about 200 km^2. However, in the last two decades, the city has sprawled beyond these boundaries, as illustrated in Figure 3.It displays the extent of the urbanised areas of Accra in 1985, 1991 and 2002 as well as the extent of the area that is under conversion to urban use in 2002. The maps are based on texture-based classification of Landsat (E)TM satellite images (Yankson et al 2004). As show in the maps, the city of Accra actually covers AMA, as well as parts of Ga West, Ga South, Ga East, Tema Metropolitan Area (TMA), Ashaiman and Adenda.

[2] As the boundaries of the newly established districts have not yet been defined officially, the boundaries shown on this map should be considered as approximate boundaries.

The report of the fifth round of the Ghana Living Standards Survey (GSS, 2008), defines the Accra Metropolitan Area (AMA), Tema Municipal Area (TMA) (which at that time also covered Ashaiman and Adenta municipality), and the urban areas in Ga East and Ga West (which at that time included Ga South) Districts as the **Greater Accra Metropolitan Area (GAMA)**. Other terms which can be found in reports and literature to describe the same urban area, include "Mega Accra" and "Accra Tema Metropolitan Area" (ATMA).

This document will as much as possible focus on the GAMA area. This area covers a total area of about 1,261 km^2 (Twum, 2002).

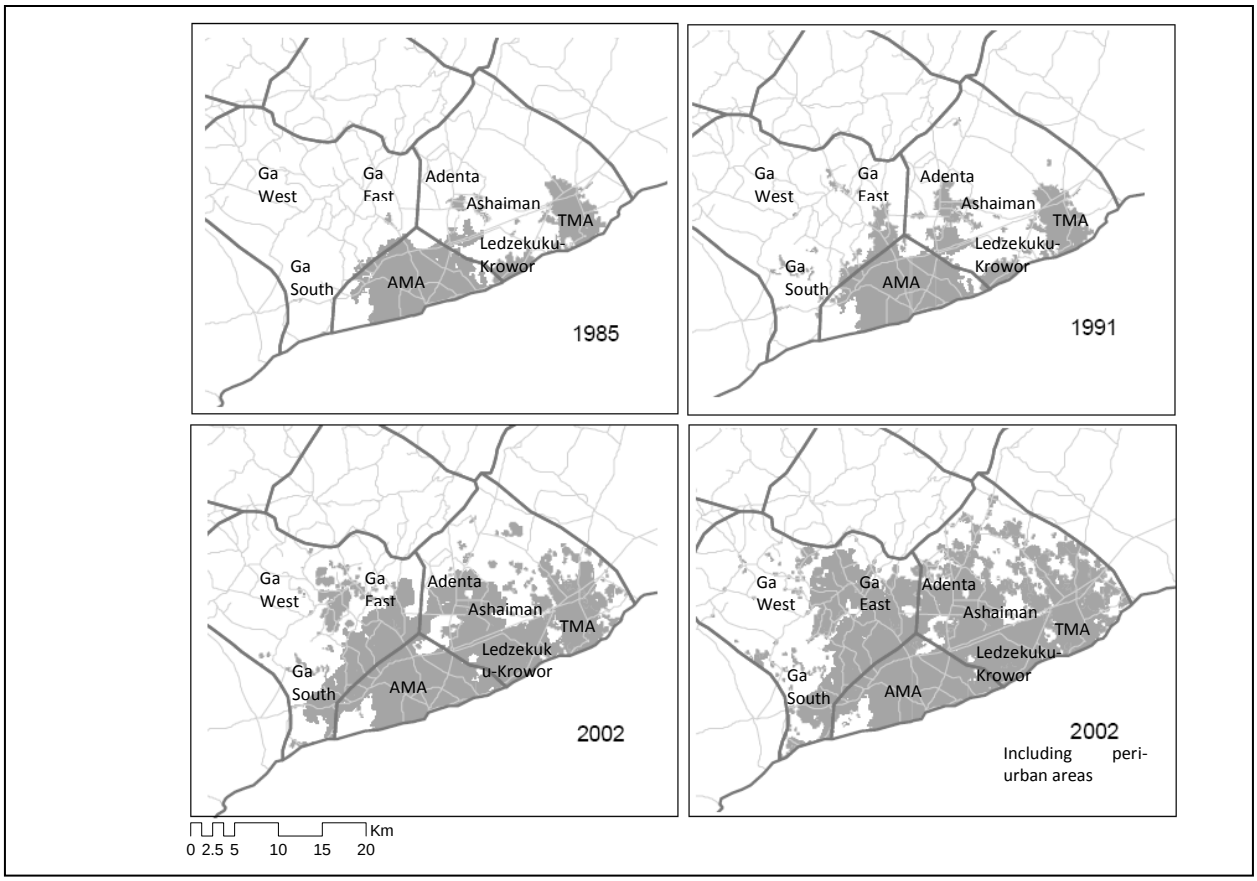


Figure 3: Growth of Accra from 1985 – 2002
Source: Yankson et al, 2004

2.2 Administrative structure

The eight metropolitan and municipal areas that constitute the Greater Accra Metropolitan Area are managed by Assemblies. The Metropolitan and Municipal Assemblies derive their mandate from the Local Government Act of 1993 (Act 462).The structure of these assemblies is also spelt out in the act. By this act, the Assemblies are the highest political authorities mandated to govern a municipality or metropolitan area and to provide basic infrastructure and services to support the social and economic development of the area. The area under the assemblies is sub-divided into sub-metros, which are in turn further divided into town or areas councils and unit committees.

Representatives from the sub-metro structures form the General Assembly. Members of the Assembly are voted from Assembly elections which are held every four years. The general assembly is responsible for making decisions and passing by-laws. This Assembly is chaired by a presiding member while the day-to-day administration is handled by the chief executive (mayor or metropolitan/municipal chief executive), who is also a member of the Assembly.

The Accra Metropolitan Assembly (AMA) was up to mid 2004 divided into six sub-metros. In 2004, the number of sub-metros was increased to 13 by further sub-dividing the original six (Ghana Health Services 2008). In February 2008, two sub-metros, Teshie and Nungua, were split off from AMA and joined to form the Ledzekuku-Krowor municipal (with Teshie-Nungua as the district capital). Currently, AMA consists of 11 sub-metros: Ablekuma Central, Ablekuma North, Ablekuma South, Ashiedu Keteke, Ayawaso Central, Ayawaso East, Ayawaso West-Wuogon, La, Okaikoi North, Okaikoi South, and Osu Klottey.

2.3 Accra's population

The population of the Greater Accra Metropolitan Area was estimated to amount to about 2.7 million inhabitants in the year 2000 on about 1261 km^2 land (Twum-Baah, 2002), which gives a population density of about 2,154 people per km^2.

The projection for population growth of GAMA/ATMA done under the Review and Updating of the Strategic Investment Plan (SIP) of the Ghana Water Company Ltd (GWCL) (TAHAL Group, 2008), does not use administrative boundaries, but areas grouped together into three main groups: Accra, Tema and Accra Rurals. This projection is based on the 2000 population according to the 2000 census (GSS, 2002) and a population growth rates as used by the 1998 GWCL SIP (3.5 percent). As shown in the figure below, this prediction assumes that the main growth will take place in the urban areas of Accra, rather than the more rural areas and the Tema and Ga districts.

However, as illustrated in Figure 3, the population growth of AMA is constrained by its administrative boundary and seems to be concentrated in the more rural Ga and Tema districts. This is confirmed by the GSS 1984-2000 growth rates of these areas, which were estimated to amount to 6.4 percent and 9.2 percent in the Ga and Tema districts respectively, while only 3.4 percent in AMA.

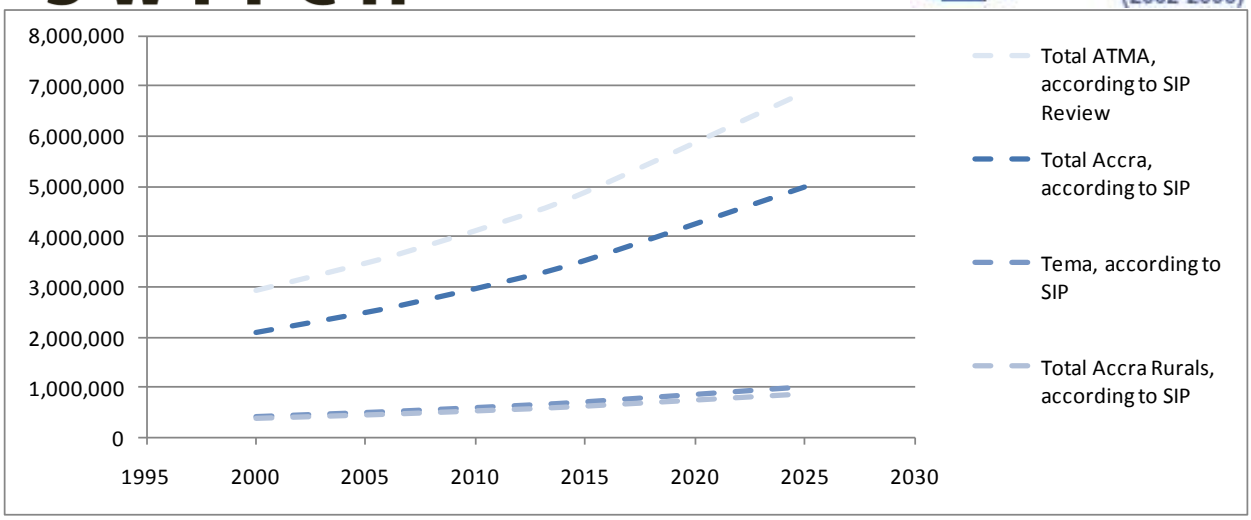
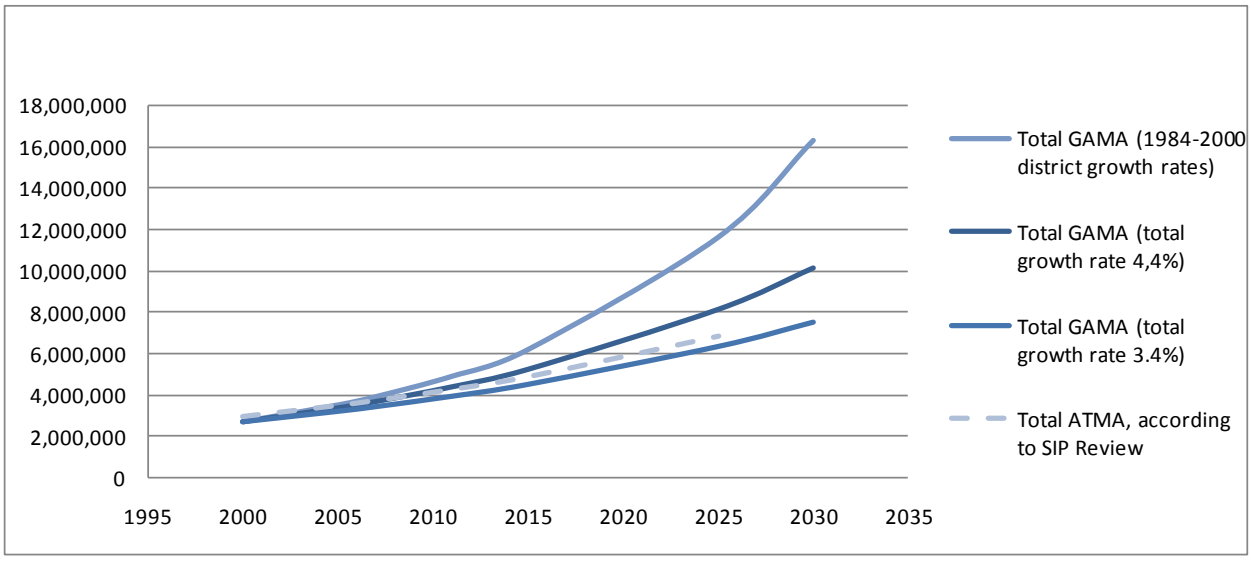


Figure 4: Population growth according to SIP

In order to project population growth from 2000-2030, this document will consider three population growth scenarios in addition to the projection as presented in the 2008 SIP. These scenarios are:

- High growth rate scenario: population growth according to the 1984-2000 growth rates per district[3].
- Medium growth rate scenario: population growth of 4.4 percent per year (based on the 1984-2000 growth rate of Greater Accra)
- Low growth rate scenario: population growth of 3.4 percent per year (based on the 1984-2000 growth rate of AMA)

The figure below shows the projected population growth from 2000 to 2030 according to these different scenarios and according to the 2008 SIP. Details can be found in annex 2.



[3] At the time of writing, the 2010 census was underway way, but results had not yet been published. Therefore, the population data from the 2000 census (GSS 2002) was used for the population projection as presented in this document.

Figure 5: Population of GAMA

According to the high growth rate scenario, the total population of GAMA would be slightly more than 3.9 million people in 2007. Assuming a low growth rate scenario, the population of GAMA would amount to more than 3.4 million people, while it would be almost 3.7 million people, assuming a medium growth rate scenario. The graphs show a wide variation of population size of the GAMA area in 2030, ranging from over about 7.5 million to over 16 million inhabitants. The population of the Greater Accra Metropolitan Area (GAMA) in 2030 might have increased to about 4.2 times the size of the population in 2007 in the high growth rate scenario (16,356,315 inhabitants), to about 2.8 times (10,166,402 inhabitants) in a medium growth rate scenario and to about 2.2 times (7,531,456 inhabitants) in the low case scenario.

With a fertility rate in the region of only 2.9 percent, the high population growth rate in the Greater Accra Region is a mixture of natural increase and rapid migration into the urban parts of the region from all over the country. Many of these migrants are unskilled, moving from rural areas into the city to look for non-existent jobs and ending up in the pool of urban poor (GSS, 2005). In addition to its residential population, Accra has large fluctuating migrant population who come to Accra to trade or work for part of the year.

Within Accra, different types of social-economic zones can be identified, as shown in Figure 6. The map, based on Songsore et al (2005)[4], shows that the main high density indigenous areas are located along the coast. These are mainly traditional fishing villages, like Teshi and James town. The areas classified as high density, low class areas are more scattered over the Greater Accra Metropolitan area. These areas mostly consist of so-called *zongo* areas, like Nima, Sabon Zongo and Madina, where many newcomers, mainly from the northern regions, have settled in their search for a better life in the big city. Obuobie et al, (2006) estimate that up to 60 percent of the population of the city (which they considered as AMA) live in slums and informal settlements. Middle density indigenous areas can mainly be found in the older residential areas within the AMA area, like Adabraka, Mamprobi and Kokomlemle. Middle density middle class areas can mainly be found in central Accra and in the Ga and TMA areas. These include areas like Kaneshie, North Teshie, Dzorwulu and Ashaiman West. The low density, high class areas can mainly be found in Eastern AMA (like cantonments, airport residential area, Kanda), but also in some Ga areas (Macarthy Hill and North Legon) and TMA (Community 12 and Motorway North Estate). It should be noted that the map shows the 'official' qualification of areas. It does not show informal settlement areas such as Old Fadama (also known as Sodom and Gomorrah). As the city is expanding, there is a trend of more and more middle and high income households moving to the peri-urban areas. This has resulted in communities in these areas with a mix of poor and rich households (Sarpong Manu and Abrampah, 2006).

Income levels are relatively high in Accra, with an annual per capita income of almost GH¢564, compared to a national average of almost GH¢400 (GSS, 2008). However, expenditure levels are also high, at GH¢1,106 per capita per year, against a national average of GH¢644.00 (GSS, 2008). The table below presents the absolute and relative number of non-poor, poor and hard core poor people in the Accra Metropolitan Area (AMA). The Ghana Living Standards Survey (GLSS) found that the number of Accra households in poverty increased from 9 percent to 23 percent between 1988 and 1992.

Table 1: Poverty levels by income in AMA

[4] It should be noted that this is based on data from 2001.

	Population	% of population
Non-poor	1,182,822	73%
Poor (between 25 and 66% of national income)	369,943	23%
Hard core poor (<25% of national income)	61,380	4%
Total population	1,614,145	

Source: based on GoG, 2003

About 82 percent of the population of GAMA is Christian, while about 12 percent is Muslim and 0.8 percent follows other religions. The remaining 6 percent does not follow a specific religion (GSS, 2008).

In AMA, there were 131,355 houses in 2000, according to the 2000 Population and Housing Census (GSS, 2000). The average number of people per house was thus about 12.The majority of the population of GAMA lives in compound houses, with multiple households per dwelling, as can be seen in the Table 2. Table 2 shows that most households rent rather than own their houses.

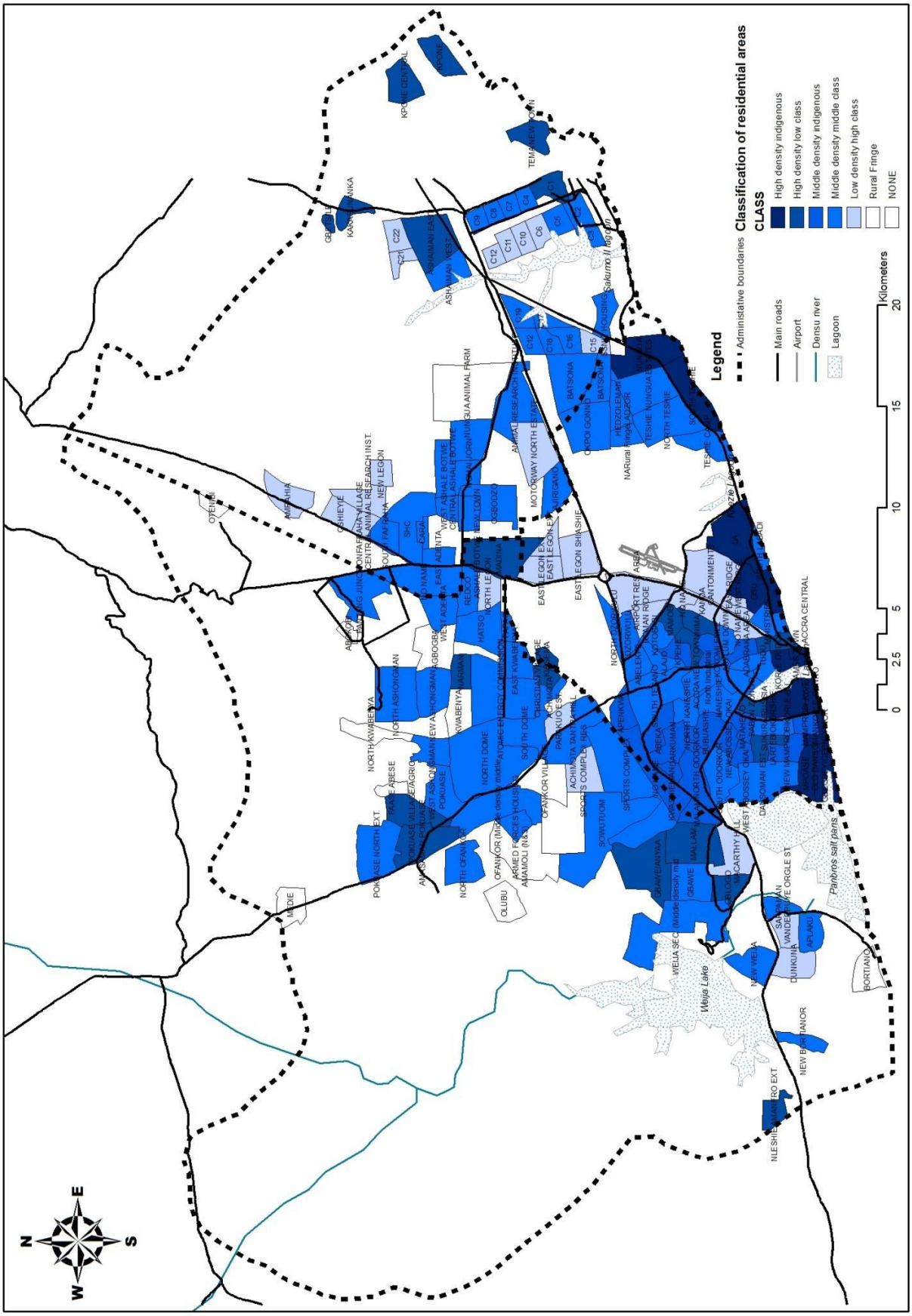


Figure 6: Classification of residential areas in the Greater Accra Metropolitan Area
Source: Songsore et al, 2005

Table 2: Type of dwelling

Type of dwelling	GAMA
Separate house (Bungalow)	8.5
Semi-detached house	6.8
Flat / apartment	8.9
Room(s) (compound house)	53.9
Room(s) (other type)	15.6
Several huts / buildings (same compound)	2.6
Tents / improvised home	2.3
Other	1.4

Source: GSS, 2008

Table 3: Occupancy status

Occupancy status	GAMA
Owning	26.6
Renting	45.9
Rent-free	24.8
Perching	2.7

Source: GSS, 2008

2.4 A summary overview of the city of Accra and its population

The above has shown that the city of Accra is a growing and expanding city, covering no less than eight metropolitan and municipal areas, each with their own assembly and administrative set-up. This area is referred to as the Greater Accra Metropolitan Area (GAMA).

Within this area, different areas with different socio-economical characteristics can be identified:

- High density indigenous areas are mainly located along the coast.
- High density low class areas are more scattered over the Greater Accra Metropolitan area.
- Middle density indigenous areas can mainly be found in the older residential areas within the AMA area.
- Middle density middle class areas can mainly be found in central Accra and in the Ga and TMA areas.
- Low density high class areas can mainly be found in Eastern AMA but also in some Ga areas and TMA.
- Rural fringes can be found on the outskirts of Accra, in all areas except for the Accra Metropolitan Area (AMA)

About four percent of the population is considered hard core poor, with an income lower than 25 percent of the national income. The poor, with an income of 25 percent and 66 percent of the national income, constitute about 23 percent of the population. The portion of non poor is about 73 percent of the population. The majority of the population (54 percent) of GAMA lives in compound houses. Many households rent (46 percent) rather than own their house.

3 A vision for the city of Accra

A vision for integrated urban water management for the city of Accra in 2030, scenarios of external factors and strategies for achieving the vision, given the different scenarios, were developed by the Accra Learning Alliance over the course of a number of workshops. This chapter presents the vision (3.1) and the scenarios (3.2) as discussed and developed by the Accra Learning Alliance.

3.1 The vision for Accra in 2030

Stakeholders involved in water management in the Greater Accra Metropolitan Area, bought together in the Accra Learning Alliance, have defined the integrated urban water management vision for Accra 2030 as follows:

In 2030, everyone in the city of Accra (the Greater Accra Metropolitan Area), regardless of economic and social status, will have access to uninterrupted water supply, at an affordable price within a reasonable distance from the house. The water quality of the supplied water will meet Ghana Standard Board criteria. Non revenue water in the GWCL system, caused by physical and commercial losses, will have decreased to 25 percent.

In 2030, at least 80 percent of Accra's citizens have access to an acceptable level of sanitation facilities, including flush toilets, KVIPs or good public toilets. Pan and bucket latrines will be phased out. Good sanitation behaviours will be practiced by at least 80 percent of Accra's citizens. There will be no more open defecation and littering, and hand-washing after toilet use will be common practice. People will willingly pay for waste management. This will have led to a 70 percent reduction in water and sanitation diseases.

In 2030, Accra will be a cleaner city with a well-functioning drainage system. There will be integrated solid waste management (collection, transport, treatment and final disposal) of solid waste in a sustainable way. At least 90 percent of the solid waste will be collected. The improved collection of solid waste will have eradicated the dumping of solid waste into small and larger drains. The drains will be free from solid waste, and pollution of the surface waters and the risk of flooding will have reduced. There will be improved productive uses of water for livelihood (micro enterprises and agriculture), especially through the reuse of storm water and/or wastewater in urban agriculture.

3.2 Scenarios

To aid in the identification of robust strategies to achieve the vision, a number of narrative scenarios of possible future trends have been developed, taking into account the external factors that have a great impact (importance) on the strategic plans and which are unpredictable (uncertain). During the SWITCH Accra visioning workshop in August 2007 (Darteh et al, 2007) stakeholders determined that the following factors are the most important and uncertain factors, which need to be taken into account when building the scenarios:

- City population
- Economic growth
- Climate change
- Power/energy supply
- Political commitment and interference
- Public awareness and attitude

Population and economic growth have direct impact on the water demand, while climate change can have direct impact on the availability of water resources. Population growth, economic growth and the resulting demands on water supply and sanitation services were discussed in chapters two, four and five, while climate change and its potential effect of water resources was discussed in chapter three. Based on this, the following narrative scenarios have been defined:

Worst case scenario:
Accra in 2030 is a depressing, chaotic and crisis prone town. The population has exploded to more than four times its 2007 level. Water demands are almost six times higher than the actual capacity of the water supply system in 2007. Lack of effective political leadership, coupled with poor economic performance and severe poverty mean a lack of ability to tackle deep-seated problems of under-investment and poor management of water supply and sanitation infrastructure. These problems are made worse by lack of raw water resources due to increased competition and a reduction in river flows.

Medium case scenario:
Accra has grown to almost three times the population in 2007, fueled in part by strong economic performance based on oil wealth. This has led to sharply increased demand for water. This demand is augmented by the rapid growth in the tourism and manufacturing sectors. However, while rapid, this growth has not been chaotic – due in large part to the marked improvement in political culture and related enforcement of planning laws and other regulations. Climate change (and competition for water from outside the city) has led to a modest reduction in overall water resource availability, which together with the strong growth in demand (four times what it was in 2007), presents major challenges. These are compounded by lack of access to finances and land for new infrastructure. However, improved management and capacities within the utility (GWCL) and local government, new technological options and engaged and empowered citizens inspire confidence that solutions will be found.

Best case scenario:
Accra in 2030 is in many ways a blessed city. Contrary to the fears of many in the early 2000s, the city's population growth, while large, has been manageable (2.2 times 2007 levels). The frequent power shortages of the early 2000s are only a distant memory. A sharply improved political culture has led to improvements in enforcement of planning laws, whilst policy is seen as progressive. This, coupled with strong economic growth (partly driven by increasing oil wealth), has led to marked improvements in citizens willingness and ability to pay for water and sanitation services. Water demands have increased because of steady population growth and economic growth (three times as high as the capacity of the system in 2007). Challenges do exist. Overall water resource availability is reduced. It continues to be difficult to source the necessary financing to upgrade the city's infrastructure and access to land for waste processing facilities and new networks is a constant problem. Nevertheless, there is guarded optimism about the ability of the city to deal with these problems.

In order to develop strategic directions towards the achievements of the above presented vision under the given scenarios, there is a need to take into cognisance the current status of water-related services in Accra in terms of infrastructure, current and future demand and access to services. Before exploring the present situation, current and future challenges and strategic directions for overcoming these challenges in order to achieve the vision in chapter five, six and seven, chapter five will focus on the first element of the RIDA analysis framework - water resources.

4 Water Resources

This chapter presents the current and foreseen future situation regarding the quality and quantity of available water resources in and for the Greater Accra Metropolitan Area (GAMA). These water resources include rainwater (section 4.1), groundwater (section 4.2) and surface water (section 4.3) resources. The box below gives an overview of the institutional arrangements around the management and regulation of these water resources. An overview of available water resources in GAMA is presented in section 4.4.

Box 1: Management and regulation of water resources

The WRC (Act 522, 1997) is responsible for the regulation and management of the use of water resources and for the co-ordination of any policy related to its functions. The act empowers the WRC to carry out the following functions:
propose comprehensive plans for the use, conservation, development and improvement of water resources;
initiate, control and co-ordinate activities connected with the development and use of water resources

Under the act, the ownership and control of all water resources is vested in the president on behalf of and in trust for the people of Ghana. No person shall divert, store, abstract or use water resources, or construct or maintain any works for the use of water resources,[5] except with the prior grant of a right by the commission. The WRC may through regulations levy charges under the act and it has in fact proposed water abstraction fees to be paid by users. The requirement to obtain a license for water abstraction beyond domestic use means that independent small-scale providers, supplying water from source to end-user, have to take steps to regularise their operations.

The EPA was established by parliament in 1994 (Act 490, 1994) following reforms aimed at protection of water and the general environment. Act 490 conferred regulatory and enforcement powers on the EPA. Currently the EPA provides guidelines for developments that affect the environment and set standards for emissions and discharges into the environment.

The agency has also developed an environmental impact assessment procedure backed by appropriate regulations that must be followed for approval of development projects. These reforms are aimed at ensuring a sustained development and management of resources and the environment to avoid exploitation of resources in a manner that might cause irreparable damage to the environment. The EPA works in close collaboration with the Water Resources Commission (WRC) on all water related issues.

4.1 Rainfall

The figure below shows an overview of the annual rainfall from 1970-2008. (see Annex 3 for details)
The graph shows that the annual rainfall is highly variable. The average annual rainfall over the period 1970 – 2008 is 756 mm. With a total land area of 1,261 km^2, the average total amount of rain that falls in GAMA within one year is about 0.954 km^3/year.

When the departure and cumulative departure from mean rainfall are analysed based on the data presented above, it seems to show a trend of a declining cumulative departure from mean rainfall since 1985, as illustrated in the figure below. However, it would be speculative to conclude from this that there is a trend of decreasing water resources. In order to be able to make a more conclusive statements about current trend, bigger data sets going back longer would have to be used, as this might be part of a rainfall cycle, rather than a pattern of decreasing rainfall.

[5] Water resources means all water flowing over the surface of the ground or contained in or flowing from any river, spring, stream or natural lake or part of a swamp or in or beneath a water course and all underground water but excluding any stagnant pan or swamp wholly contained within the boundaries of any private land.

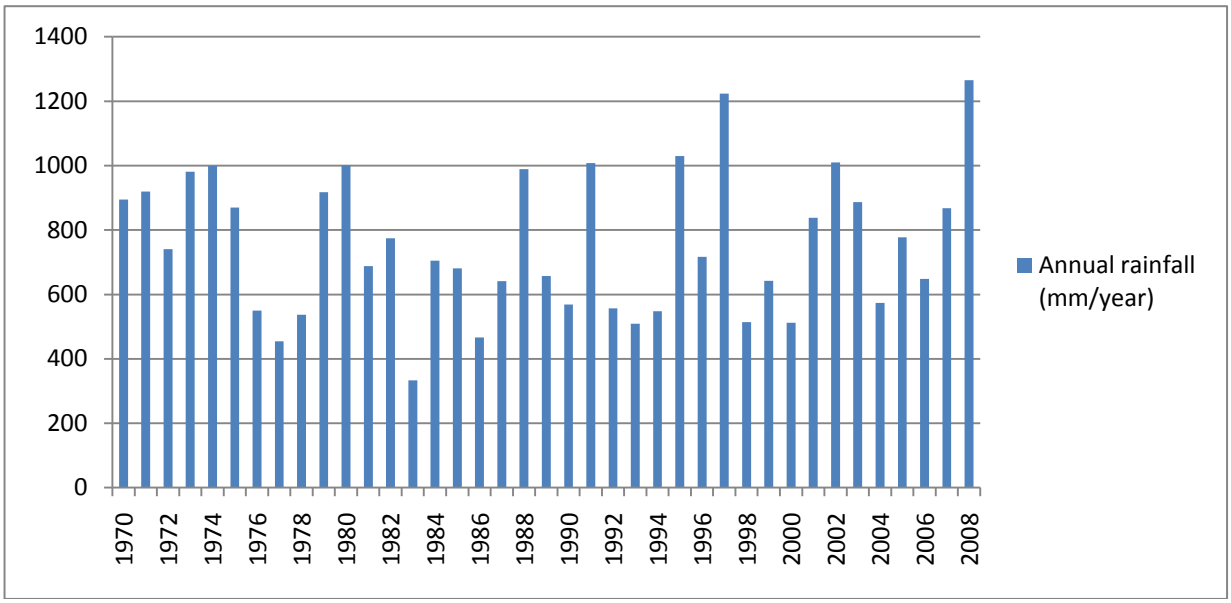


Figure 7: Annual rainfall and ET

Source: Based on daily rainfall data, from the Meteorological Services Department, station 23016ACC Accra (airport station)

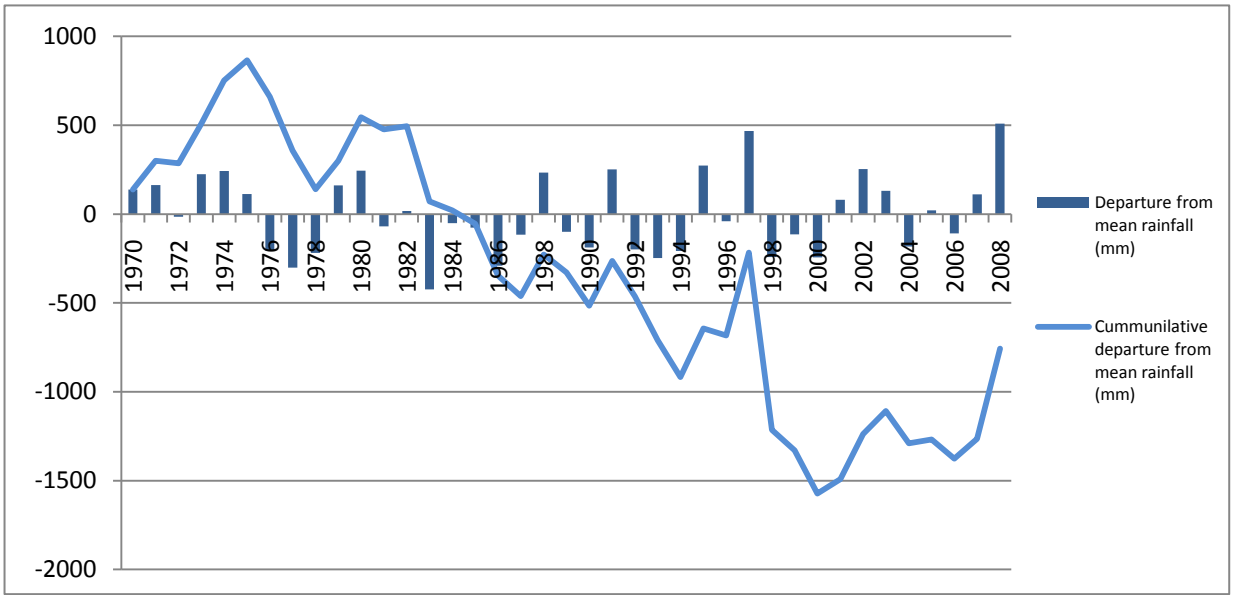


Figure 8: Departure from mean rainfall

Source: Based on daily rainfall data (mm) from the Meteorological Services Department

There is great variation in rainfall within the year. The main rainy period is from March to July, and a smaller rainy period runs from September to October, as can be seen in the figure below. The dry season spans thus about five months: from November to February and August. This is illustrated in the figure below.

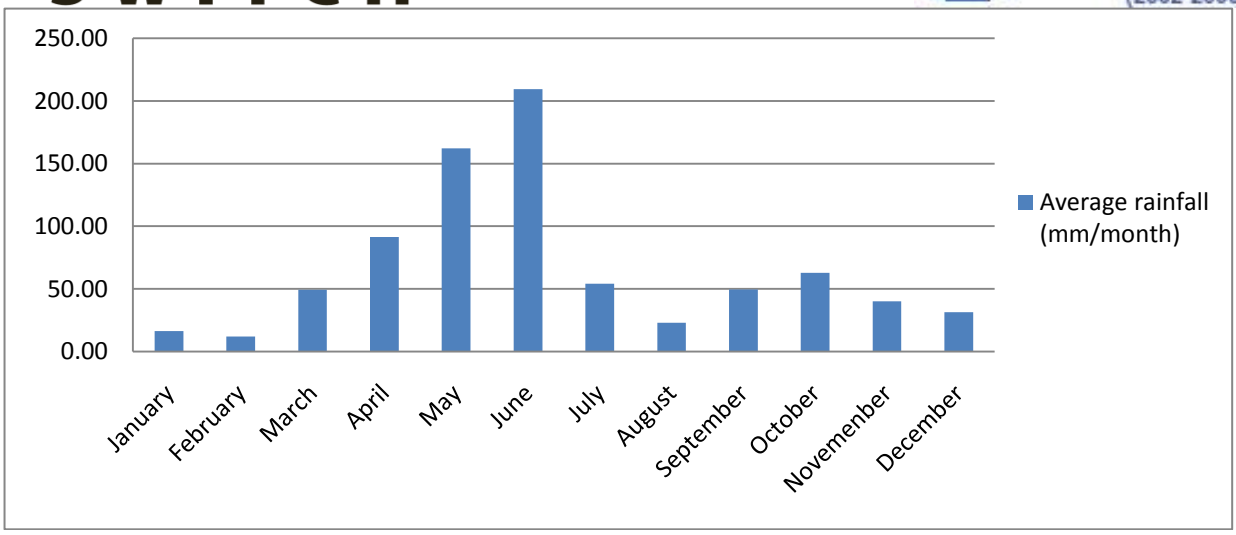


Figure 9: Monthly rainfall
Source: Based on daily rainfall data (mm) from the Meteorological Services Department (1999-2008)

Variations in intensity of rainfall are considerable and rates of 203 mm/h may be reached and even exceeded for short periods (Ghana Metrological Services Department, 2002, in Lundgren and Åkerberg, (2006). In his assessment of run-off in the GAMA area, Nyarko (2002) considered a rainfall intensity of 140.2 mm/h.

4.2 Groundwater

The geology of the Greater Accra Region is predominantly that of the crystalline basement rocks (Kesse 1985). The geological formations are the Dahomeyan system, the Togo series and Accraian. The Dahomeyan series covers the greater part of GAMA, as can be seen in the figure below. It occurs as alternating belts of acidic and basic gneisses. Accraian formations are sedimentary rocks found mainly in the Accra Metropolitan Area. The Togo series can be found at the foothills of the Togo-Akwapim ranges.

The water table varies between 4.8 and 70m (Nyarko, 2002). The mean yield of boreholes in the Dahomeyan series with a mean depth of 39m, have a mean yield of 3 m^3/hour, ranging from 0.54 to 12 m^3/hour. The yield of boreholes in the Togo series with a mean depth of 44m ranges between 0.42 and 31.5 m^3/hour, with a mean value of 5.6 m^3/hour. (WRI,1999). Boreholes in the Accraian Series have an average yield of 3,9 m^3/hour (Ghana Mining Portal). According to Darko (2005), the probable yield in zones with negative transmissivity anomalies would be 0.36 m^3/hour in the Dahomeyan and 0.6 m^3/hour in the Togo Series formation. In areas of positive anomalies, the expected yield would amount to 2.1 m^3/hour and 7.2 m^3/hour in the Dahomeyan and Togo Series formations respectively.

It is difficult to give an estimate of the volume of suitable groundwater that could be extracted in a sustainable way. Taking a conservative estimate for ground water recharge of four percent of the rainfall, and using an annual rainfall of 756 mm, the recharge can be estimated to amount to about 30mm. Over the entire Greater Accra Metropolitan Area, this would mean a total recharge of about 0.0381 km^3/year. In that case, a total of 1,116 boreholes with an average yield of 3,9 m^3/hour (93,6 m^3/day) could in theory abstract ground water, without deflating the groundwater resources.

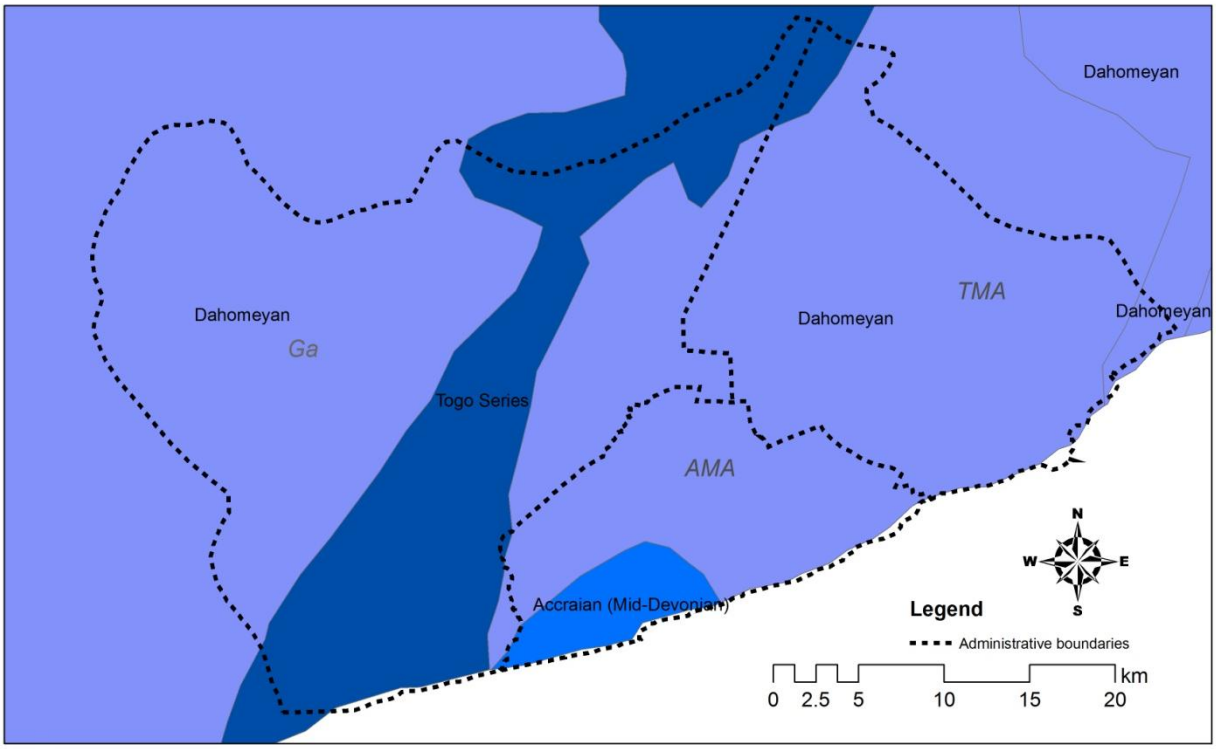


Figure 10: Geology of the Greater Accra Metropolitan Area

The classification of the groundwater using the Durov diagram, indicates NACl waters as the dominant water type, with minor $MgCl_2$ and $CaCl_2$ waters. Ground water salinity increases from north to south, going towards the coast. The origin of the high salinity levels of the groundwater can be attributed to several probable causes. Halite dissolution from the soil zone as a result of aerosol deposition seems to be the main cause of groundwater salinity, according to Kortatsi and Jørgensen (2001). They identify saline water intrusion as the main cause for salinity of the groundwater close to the cause. They do not mention possible causes of this sea water intrusion. Evaporative concentration of surface waters contributes to salinisation on a small scale, according to Kortatsi and Jørgensen (2001).

4.3 Surface water

There are a number of river basins partly or fully located in GAMA , as can be seen in Figure 1. This section gives an overview of these basins. As the population of the Greater Accra Metropolitan area depends to a large extent on water from the Volta Basin, located outside the boundaries of GAMA, this catchment is considered here as well.

4.3.1 Surface water in Accra

Only part of the Densu Basin can be found in GAMA. The total drainage area of the Densu Basin is about 2,500 km^2 (WRC, 2008). It is divided into two sections: above and below the Weija dam. The northern section of the basin, which extends 100 km inland along the Densu River and its tributaries, is hilly. The southern section of the basin consists of low-lying land which is largely urbanised now. The Densu River runs from its source in the Atiwa Range near Kibi to the Weija Reservoir, before entering the Sakumo 1 lagoon and Panbros salt pans and finally the Gulf of Guinea (WRC, 2008).

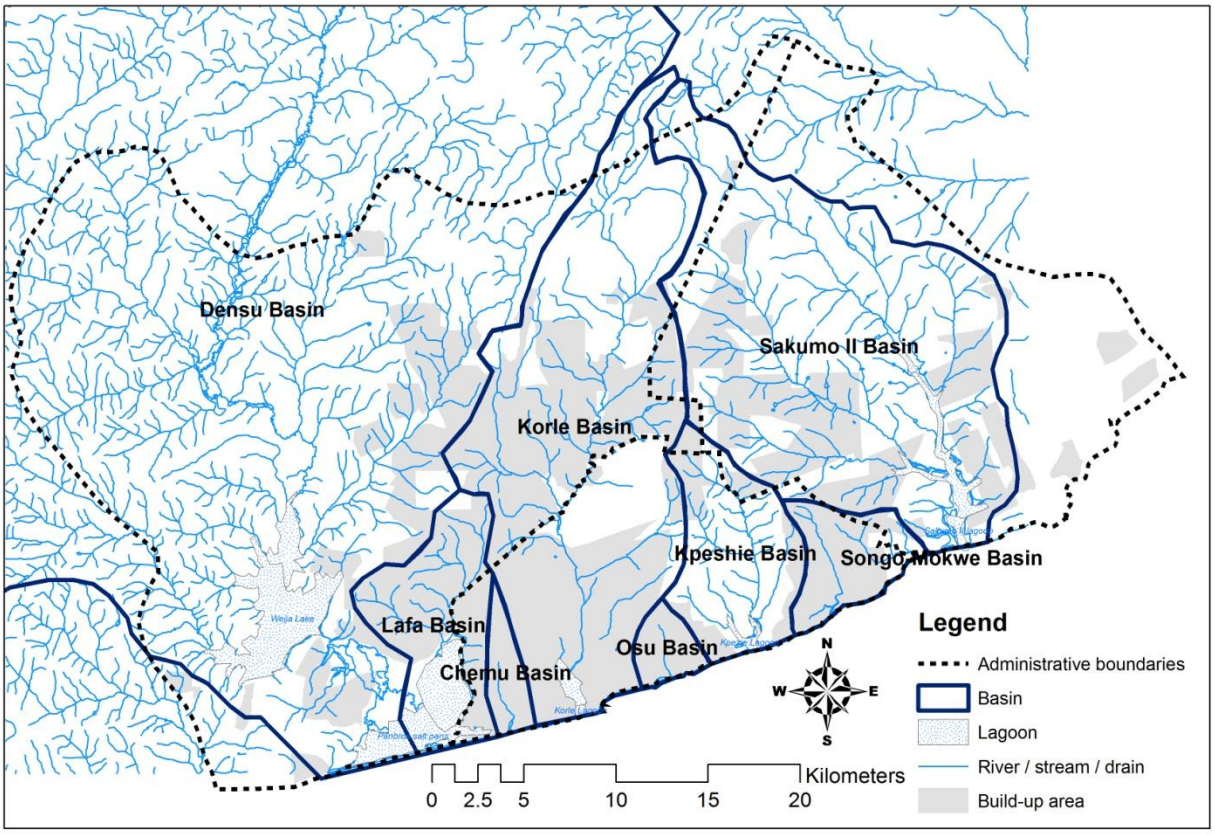


Figure 11: Basins in the Greater Accra Metropolitan Area

The population density in the Densu Basin is, with 240 persons per km^2, considerably higher than the national average of about 100 persons per km^2. The main occupation of inhabitants of the basin is agriculture. Due to uncontrolled human activities that generate waste, untreated sewage, fertiliser and pesticide run-off in the Densu Basin, very high colour, turbidity and nutrient levels have been identified in the Densu river (WRI 2003). Raw water at the Weija dam has been reported to have a biological oxygen demand of 10 mg/l (which is high considering that moderately polluted rivers generally have a BOD of 2-8 mg/l) and a chemical oxygen demand of 49 mg/l (Lundéhn and Morrison, 2007). A general trend of water quality deterioration in the Weija lake has been observed (Ansa-Asare and Asante, 2005, and Asante et al, 2008).

The Lafa stream flows into the lagoon and drains much of the western area of Accra including Dansoman, Kwashieman, McCarthy Hill and Awoshie.

The Korle-Chemu Catchment covers an area of about 291 km^2 (Nyarko, 2002)[6]. The principal streams that drain the catchment are the Odaw River and its tributaries, the Nima, Onyasia, Dakobi and Ado (AMA, 2006).

[6] 250 km^2 according to AMA (2006)

The Odaw river drains Dome, Legon, Achimota, Ring Road Industrial Area and the high density, low income areas of Nima, Maamobi and Accra Newtown. The catchment area of the Odaw river is densely populated and has a large concentration of industries including Ghana Breweries Limited, several textile factories and vehicle repair workshops. The eastern channel drains the eastern and central parts of Accra, including areas around Accra Brewery Limited. Several light industries are situated in this area. The western channel drains the western parts of Accra including Kaneshie and Korle-Bu Hospital. These areas are mainly residential, with an array of vehicle repair shops. The major channels are interconnected by a network of medium and smaller-sized drains, which are mostly uncovered and are often used for the disposal of untreated domestic and industrial effluents, which are ultimately flushed into the lagoon by flood waters.

The water of the Odaw is highly polluted. The BOD has been measured to be 240 mg/l and the COD 2560 mg/l (Awuah and Fiakuma, 2007), which is far in access of the EPA and WHO norms, as presented in the table below.

Table 4: Water quality standards

	EPA Standards for Inland Watercourse (EPA 2000)	WHO Standards for Coastal Water:
Biological Oxygen Demand (BOD) (ppm)	< 50	< 2
Chemical Oxygen Demand (COD) (mg/l)	< 250	
Total Suspended Solids (ppm)	< 50	< 5
Total Fecal Coliform Count (FC/100ml)	< 400	< 500
E. Coli Count (MPN/100ml)	< 10	
N-NH4		< 0.5

The Odaw discharges into the Korle Lagoon. In addition, there is a minor outfall at Chemu. The Korle Lagoon empties into the sea near Korle Gonno. This southern-most section is tidal. The lagoon, with a surface of about 0.6 km^2, was dredged between 1961 and 1963. In addition, inadequate attempts to deepen the tidal sections were made in 1976. Its capacity has been seriously reduced by siltation and also by the proliferation of mangrove vegetation of the species Rhizophora (deGraft-Johnson, 1991; Amoah et al, 1998). Siltation of the lagoon is, to a large extent, caused by flood waters which erode the commonly unpaved areas in the catchment and transport the silt into the lagoon (Karikari, Asante and Biney, 2006).

A survey conducted in April 1997 indicated that the entrance of the Korle lagoon, in which the Odaw discharges, is moderately to grossly polluted as evidenced by the physical, chemical and bacteriological characteristics (Karikari, Asante and Biney, 2006). The Korle Lagoon has been mentioned as one of the most polluted water bodies on earth (Bourgoing, 1996; Boadi and Kuitunen, 2002). Causes for this include discharge of domestic and industrial effluents from inland and the operations of the sewage outfall in the vicinity of the lagoon entrance. At high tide, the effluents from the outfall are back-washed into the lagoon. The extremely high levels of BOD, SS, coliforms and ammonia-nitrogen of the raw sewage are an indication of the extent of organic pollutants introduced into the sea. However, according to Karikari, Asante and Biney (2006), samples collected 500m offshore showed good water quality, which can be primarily attributed to dilution. So although the outlet of the lagoon and immediate environment are moderately to grossly polluted because of discharges from the sewage outfall and from inland, this negative impact is significantly reduced less than one km offshore as a result of the dilution

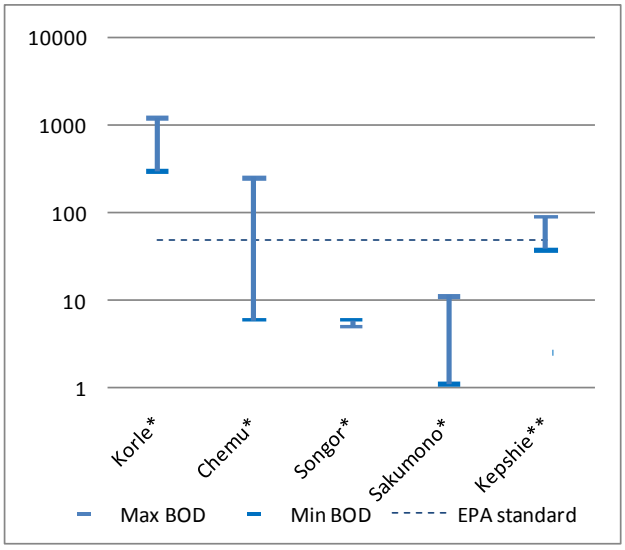
effect of the open ocean. This process is important for artisanal fisheries, such as beach seining, which take place within the zone less than one km from the beach.

The Kpeshie drainage basin covers a relatively small catchment area of about 62.6 km^2 (Nyarko, 2002)[7]. Streams in the catchment empty directly into the principal outlet to the sea at Kpeshie Lagoon or the small Korle Lagoon at Osu.

The Songo-Mokwe Catchment is the smallest drainage basin in the Accra Metropolitan Area. It covers about 31 km^2 (Nyarko, 2002)[8], draining the area of Teshie. Two main streams drain the area flowing into the Mokwe and Songo Lagoons. Much of this catchment is undergoing residential development. (AMA, 2006).

Finally, the Sakumo II catchment mainly drains the Tema Municipal Area and discharges most of the drained water in the Sakumo II lagoon. It covers an area of about 280 km^2 (Nyarko, 2002).

The figures below give an overview of water quality characteristics for some lagoons in the GAMA area.



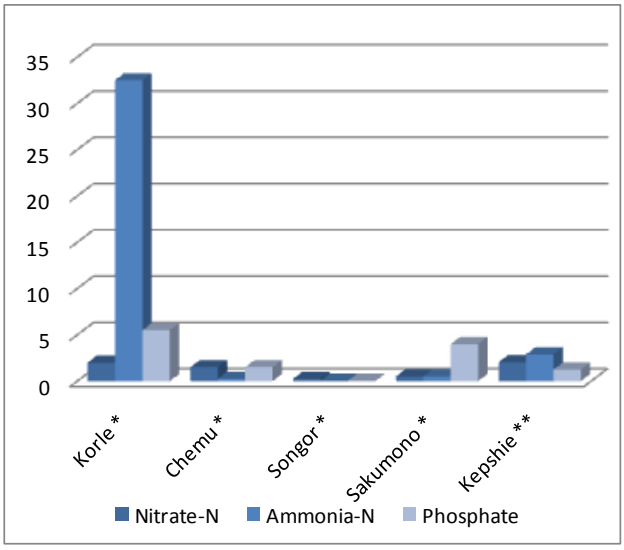


Figure 12 (left): Maximum and minimum BOD (ppm)
Figure 13 (right): Nitrate, ammonia and phosphate concentrations in lagoons (mg/l)
Source: * Kankam-Yeboah, 2007; ** Awuah, Ansah and Ackerson,2009

4.3.2 Surface water for Accra

The **Weija dam on the Densu river** is located some 20 km from the centre of the Accra and is one of the main sources of water supply for the Greater Accra Metropolitan Area. The dam was initially realised in 1952 to supply potable water for Accra and was reconstructed in 1978. According to the station manager of the Weija GWCL treatment plant (personal communication Mr. Micheal Amuakwa, 2007), the maximum surface area at 15.24m of the impoundment is 33.59 km^2. The optimal safe yield from the system is 272,765m^3/day (about 0.10 km^3/year) and a volume of impoundment of 212,546 m^3. The

[7] 110 km^2, according to AMA (2006)
[8] 50 km^2, according to AMA (2006)

mean inflow is 54.2 m^3/s at the peak of the rainy season. The mean annual run-off is 0.5 million km^3 (about 16 m^3/s).

The other main source of water for Accra is the **River Volta**. The Volta Basin is located entirely outside the Greater Accra Metropolitan Area, as can be seen in the figure below. It covers six countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Togo and has a total area of 400,000 km^2. The three main rivers, the Black Volta, the White Volta and the Oti discharge into the world's largest artificial lake: the Akosombo Reservoir - more commonly named Volta Lake.

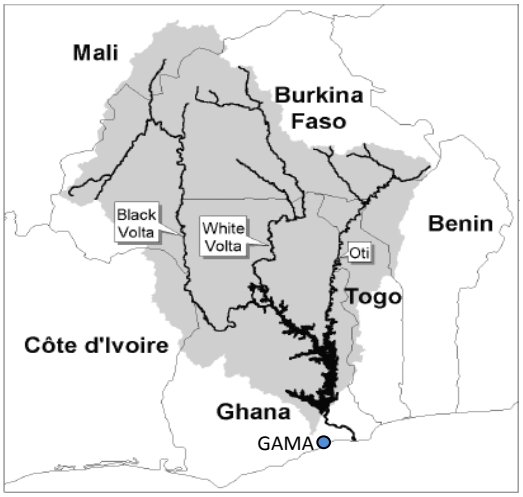


Figure 14: The Volta Basin

The Volta Lake was created by the construction of the Akosombo Dam (1961-1964). The main reason for the construction of the dam was hydro-electricity generation. As demand for electricity increases, there is a temptation to generate power at higher rates despite drought or storage deficits (Andreini et al, 2000). The lake has a storage capacity of about 148 km^3. However, according to Andreini et al (2000), the mean volume stored in the reservoir in the 1970s was only 132 km^3. In the 1980s and 1990s, the mean volume stored decreased to 102 km^3. The amount of water flowing through the Akosombo Dam increased from 28 km^3/yr to 35 km^3/yr in the 1990s (Andreini et al, 2000).

Friezen et al (2005) estimate the coefficient of variation for rainfall in the Volta Basin to be only 0.08 (1931-1995), with an average of 400 km^3 /year. The coefficient of variation in run-off is however estimated to be far higher: 0.38, with an average discharge of 43 km^3/year[9] (1931-1995) (Friezen et al, 2005). The level of inflow was considerably below this average in 1983 (about 7.6 km^3), in 1997 (26.5 km^3) and in 2006 (23.8 km^3), which resulted in lower water levels at Akosombo and the electricity crises of 1984, 1998 and 2007 (Ameko, 2007). The minimum level needed for hydro-power generation is 73.15m. The figure below shows that this level was approached in 1984 and again around 1998, 2002 and 2003.

There is some concern that climate change will have a negative effect on the availability of water for the city of Accra. WRI (2000) simulated the change in river flow in the Volta Basin, based on different General Circulation Model (GCM)-based global climate change scenarios. According to this, the stream flow will have decreased by the year 2020 with 8.5 percent in case of low sensitivity, with 15.8 percent in case of medium sensitivity and with 22.9 percent in case of high sensitivity. In the worst case scenario, the flow of the Volta would thus decrease to 33 km^3/year.

[9] 37 km^3/year, according to Rodier (1964)

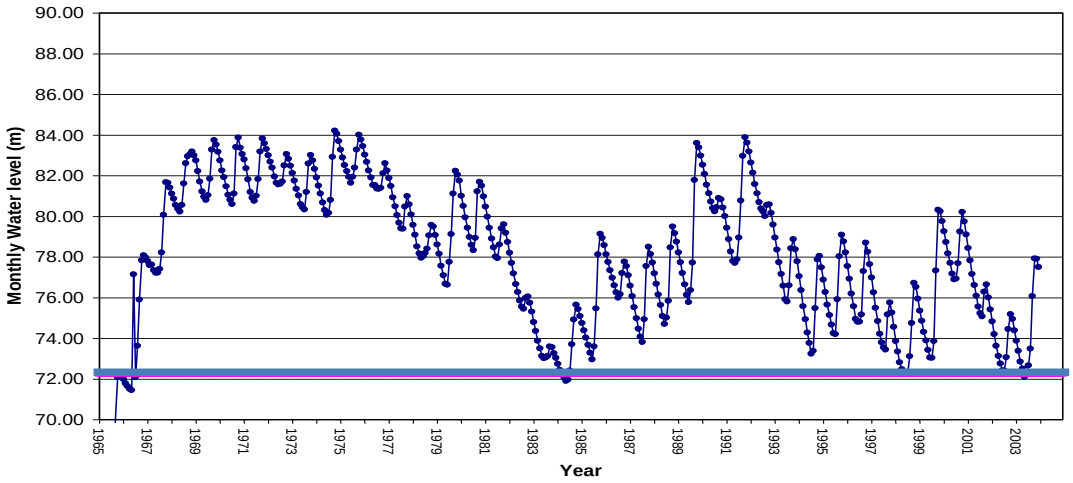


Figure 15: Water level at Akosombo 1965-2003
Source: Ameko, 2007

In addition, there is concern that upstream increased water use will lead to downstream water shortages. Based on a synthesis of country reports, Andah (2005) projects the demand on water from the Volta river, as indicated in the table below (for details per country, see annex 4). This shows a big increase in water demand, especially from the irrigation sector. The projected total water demand for 2025 is almost 20 percent of the average discharge of 43 km^3/year (1931-1995). Taking into account the worst case scenario of a decreased flow of 22.9 percent, the water demand of 2025 would amount to about 25 percent of the average discharge, which seems to suggest there is little reason for concern for the availability of water for the city of Accra. Decreased water flow caused by climate change and increased upstream water use can however have serious consequences on the water levels in the dam, which can have serious consequences on electricity generation from the dam.

Table 5: Water demand in the Volta Basin

	2000	2010	2020	2025
Projected domestic and industrial water demand (km^3)	0.360	0.604	0.891	1.058
Projected irrigation water demand (km^3)	1.169	3.170	5.974	6.730
Projected livestock water demand (km^3)	0.166	0.294	0.430	0.511
Total	1.695	4.068	7.295	8.299

Source: Andah,2005

The quality of raw water from the Volta is better than that of the Densu due to two large dams that serve as sedimentation basins for the raw water. However, as the population in the surrounding villages continue to grow, the situation is likely to worsen both at Weija (Densu) and Kpong (Volta) in the near future. (Uusitalo, 2002;Salifu and Mumumi,2000)

4.4 Overview of water resources within and for Ghana

Figure 16 gives a schematic overview of the water resources present in (within the dashed line) and available for (in blue) the Greater Accra Metropolitan Area. Water resources available for water supply are limited within the boundaries of the Greater Accra Metropolitan Area (GAMA), both in terms of quantity, as well as in terms of quality. The water quality of several rivers and lagoons within the city of Accra is below WHO and EPA standards, especially in the Odaw and the Korle lagoon. Groundwater is too saline in large parts of the greater Accra Metropolitan area, especially near the coast.

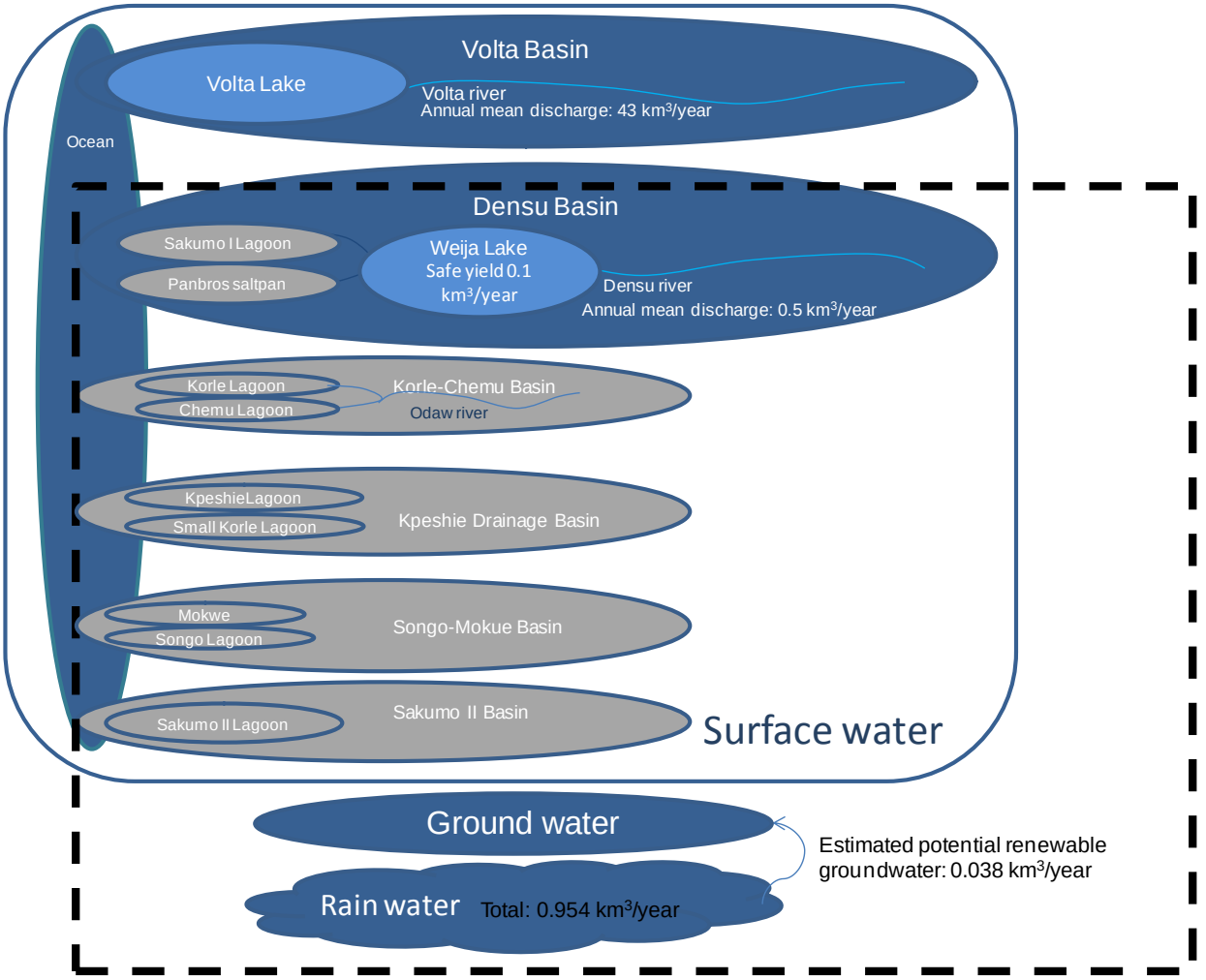


Figure 16: Overview of water resources

However, the Greater Accra Metropolitan Area is located at the downstream end of the Volta and the Densu basin, from where large amounts of water can be abstracted. The optimal safe yield from the Weija lake is about 0.10 km^3/year. With an average annual discharge of about 43 km^3/year, the potential yield from the Volta is determined by the capacity of the intake and treatment infrastructure, rather than by the availability of water resources, even when considering a potential drop in river flow caused by climate change and increased use of water upstream in the basin.

The next chapter will take a closer look at the abstraction of water for water supply for the Greater Accra Metropolitan Area.

5 Water supply services

Within the Greater Accra Metropolitan Area, four main models for the delivery of water services can be found: utility managed water supply, managed by Ghana Water Company Limited (GWCL); privately managed water supply; community managed water supply; and self supply. Private managed water supply can either depend on the GWCL network (intermediary private providers) or on own sources of water (independent private providers). A schematic overview of these service providers is given in the figure below. Households can rely on different service providers for their water supply.

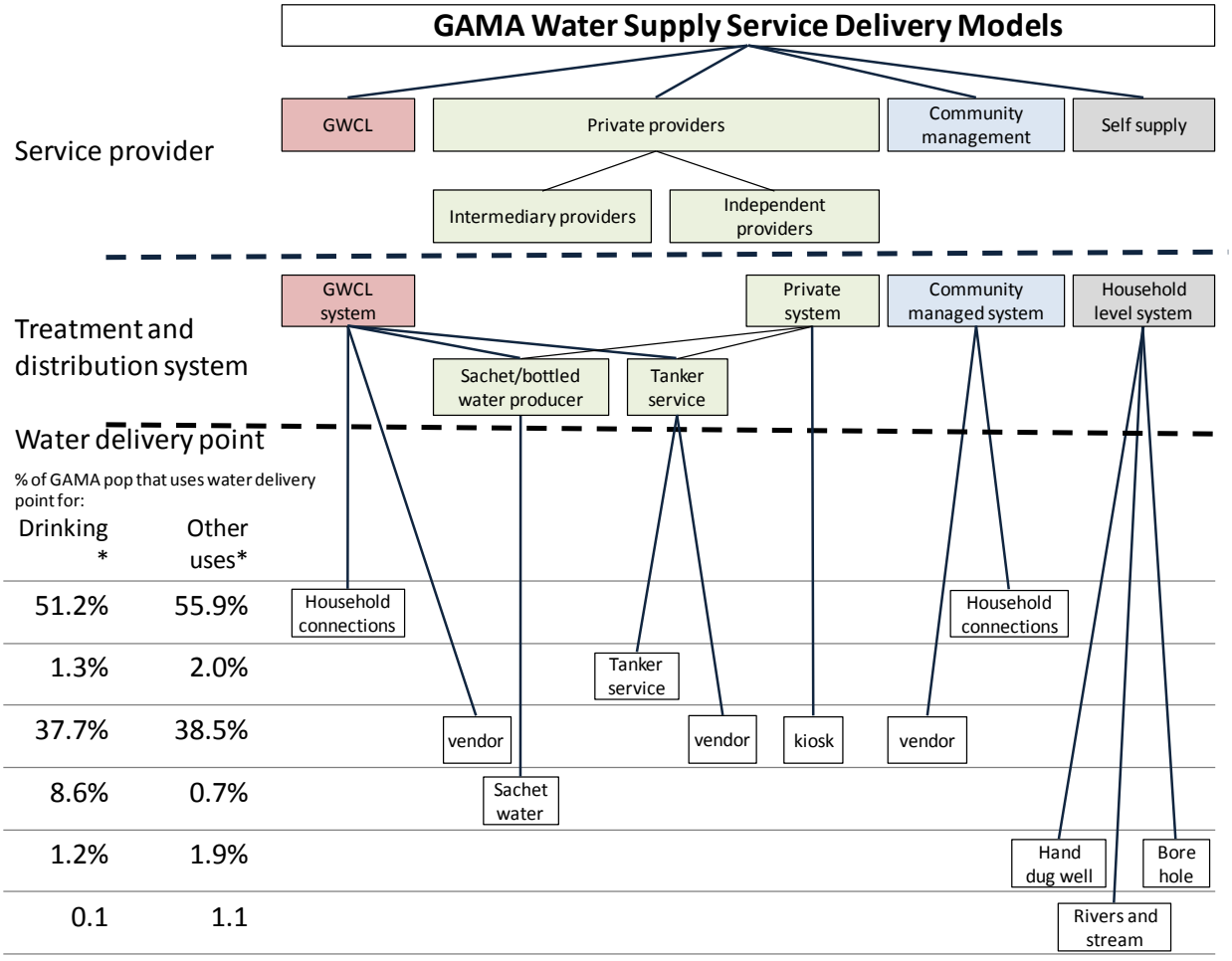


Figure 17: Water service delivery models in GAMA
Source *: GSS, 2008

Besides giving an overview of the different service delivery models, the figure above gives an indication of the percentage of people in the Greater Accra Metropolitan Area with access to different types of

water delivery points as their main source of water supply for drinking and for other uses, based on the findings from the fifth round of the Ghana Living Standards Survey (GSS, 2008) (see annex 5 for details). Access to these water delivery points and the barriers people face, will be discussed in more detail in section 5.3. Before going into access to water services, the main water supply infrastructure serving the Greater Accra Metropolitan Area is described in section 5.1. This is followed by an overview of the current and projected future demand for water supply services in section 5.2. Section 5.4 discusses the main current and foreseen future challenges related to water supply. Finally, section 5.5 presents suggested strategic directions, in order to overcome these challenges and achieve the vision of Accra as a city where everyone, regardless of economic and social status, will have access to uninterrupted water supply at an affordable price within a reasonable distance from home.

5.1 Water supply infrastructure

The main source of piped water for the Greater Accra Metropolitan Area is the GWCL system. As shown in the map below, a number of communities on the fringes of Accra are being served by other systems, like community-managed small town piped water supply systems, implemented by CWSA, and Small Scale Independent Producers (SSIPs) operating and managing water supply kiosks independently from the GWCL system. This section describes the utility-managed system, private service providers' infrastructure and community-managed infrastructure.

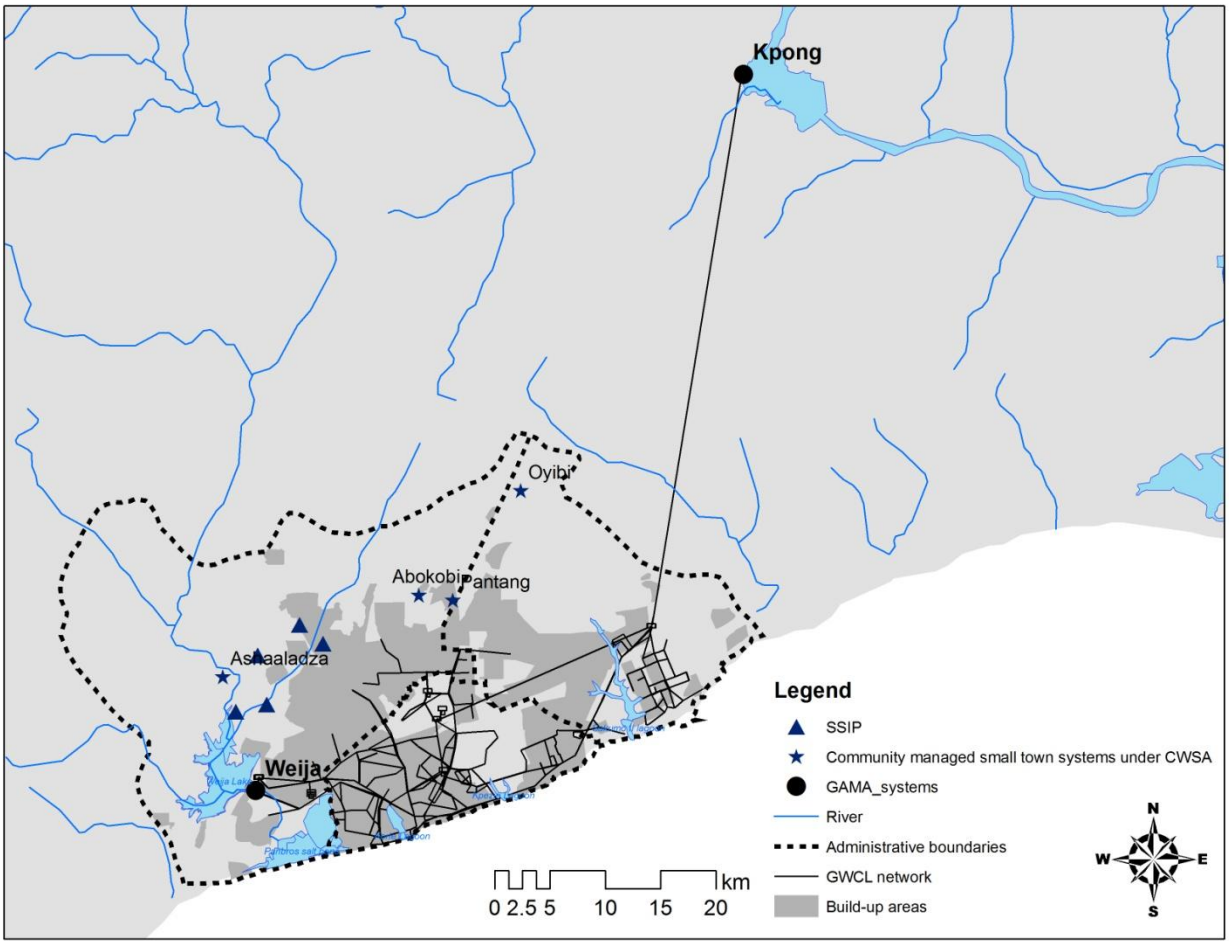


Figure 18: Water systems in the Greater Accra Metropolitan Area

5.1.1 The GWCL managed system

This section presents the capacity of the different water supply systems that supply GAMA, managed by the utility, the Ghana Water Company Limited (and operator Aqua Vitens Rand Limited), and gives a description of the distribution network and delivery points. The box below gives a description of the history and institutional set-up of utility water supply in Ghana.

Box 2: The Ghana Water Company Limited (GWCL)

The formal responsibility for urban water supply lies with the utility company **Ghana Water Company Limited** (GWCL) which is under that Ministry of Water Resources, Works and Housing. GWCL has since 1999 been operating as a limited liability company following the enactment of the *Statutory Corporations (Conversion to Companies) Act 1993* (Act 461, 1993). Its name changed from Ghana Water and Sewerage Corporation to Ghana Water Company Limited. The main objects of GWCL are to provide, distribute and conserve water for domestic, public and industrial purposes. Following the establishment of Water Resource Committee (see Box 1), the Public Utility Regulatory Committee (see Box 3), and the enactment of the *Local Government Act* (Act 462, 1992), certain functions that GWCL previously performed, have been reallocated to these regulatory agencies. Examples include the setting of standards for water supply and the monitoring of drinking water quality, which are now performed by PURC. The sewerage functions of the water company have been transferred to the MMDAs/local government (see **Error! Reference source not found.**). Therefore the GWCL is no longer required to establish, operate and control sewerage systems in Ghana. GWCL is responsible for its customers and until one is connected to the formal utility one is not considered a customer even though one consumes water.

As part of urban water sector reforms, GWCL entered into a five-year management contract with Aqua Vitens Rand Limited (AVRL), a Dutch-South African joint venture in 2006. This management contract was met with a lot of public agitation. This was due to the perception that all asset of the utility company were going to be handed over to a private person. Despite this outcry, the management contract was made with the justification that it will help to improve the water supply (especially to the poor). Under the current management contract, GWCL (grantor) is responsible for planning and investments in capital projects. AVRL is responsible only for operation and management of the systems and for replacements that are not considered as major capital expenditures. This means that having investments made to improve the water supply system is the responsibility of GWCL. GWCL draws up its own strategic investment plan and decides on the future expansion and direction of water supply in the country.

AVRL operates a total of 86 systems spread out over the 10 regions of Ghana. In the Greater Accra Metropolitan Area (or ATMA, as commonly referred to by GWCL/AVRL), GWCL/AVRL has defined three regions which are subdivided in a total of 13 districts. The boundaries of these regions and districts do not match the administrative boundaries, as show in the figure below.

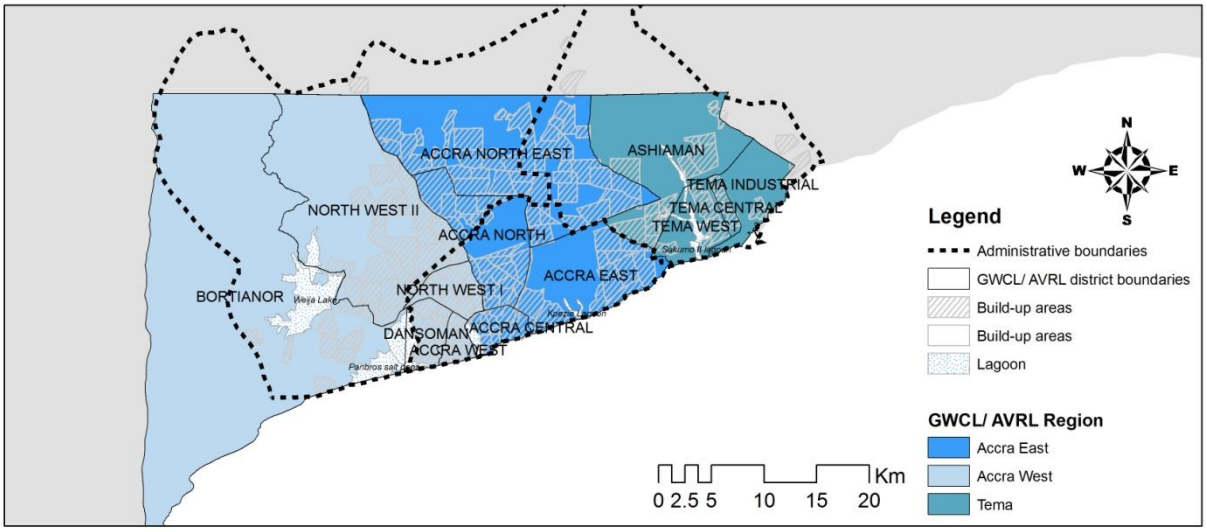


Figure 19: GWCL/AVRL regions and districts

Currently, almost at the end of the five-year management contract, there are mixed feelings about the benefits that the country has gained. Many civil society organisations are of the view that consumers, especially the urban poor, did not benefit. AVRL argues, however, that they have improved on the existing system, reduced losses through illegal connections and increased revenue to the water company. They, however, note the challenges they have to go through with the national procurement system and also the fact that they do not own the asset and cannot make the needed capital investment required. This means that they have to rely on GWCL and it is challenging for them to receive some of the needed inputs for the system. From the PURC side, AVRL has not performed badly since they have approved a number of tariff increases based on performance of the provider. They also indicate that the private operator has been consistent with providing reports as required by their contract.

Treatment capacity of the GWCL system

The GWCL system in the Greater Accra Metropolitan Area is supplied by two main systems: the Kpong system on the Volta river and the Weija system on the Densu river. The table below shows the capacity of these systems and the actual production in 2007.

Table 6: Capacity of water supply systems

System name	Production of raw water (m^3/year)	Production of treated water (m^3/year)	Plant capacity, design (m^3/day)	Average plant capacity actual (m^3/day)	% Average plant capacity of design capacity
Kpong New	61,369,489	58,136,665	181,818	159,280	88%
Kpong Old	13,131,091	12,464,845	38,636	34,150	88%
Total Kpong	74,500,580	70,601,510	220,454	193,430	88%
Weija -Adam Clark	48,117,071	44,746,911	134,000	122,580	91%
Weija Candy	6,926,738	8,598,451	39,440	23,555	60%
Weija–Bamag	12,330,064	8,650,654	30,240	23,852	79%
Total Weija	67,373,873	61,996,016	203,680	169,987	83%
Total	141,874,453	132,597,526	424,134	363,417	86%

Source: AVRL, 2008 (Data from 2007)

As shown in the figure below, the amount of treated water produced seems to be fairly constant over the year. The figure also shows a big different between the amount of water produced and the amount of water sold. This is discussed in more detail in Section 5.3.1.

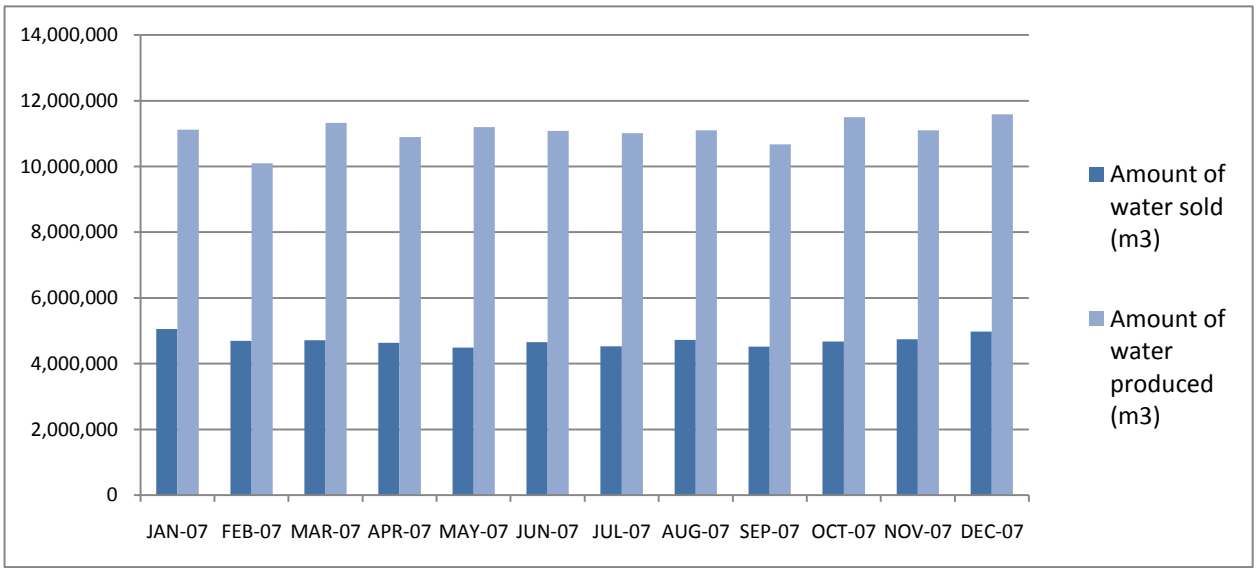


Figure 20: Variation of water sold and treated and water produced over the year
Source: AVRL, 2008(Data from 2007)

From the Weija Waterworks on the Densu River, the water is pumped to treatment facilities composed of three plants: Pintsh-Bamag and Candy (old plants) and the Adam Clark or Canadian plant (new plant). In 2007, the combined output of these three plants was 169,987 m^3/day, which is about 83 per cent of the plant capacity of 203,680 m^3/day (AVRL, 2008). The water is transported by gravity to Accra and communities on the western side of the city.

The Kpong waterworks on the Volta River is located downstream from the Akosombo Dam, 54 km north of Tema. The water is pumped from the intake to the adjacent treatment facilities consisting of two plants: the 'new' Kpong plant which mainly supplies the urban areas, and the 'old' Kpong plant which supplies mainly the rural areas (Columbia University, 2003). The design plant production is 220,454 m^3/day. In 2007, the actual average capacity was 193,430 m^3/day (AVRL, 2008), which is about 88 percent of the design capacity.

The consumption of chemicals to treat the raw water is higher at Weija (7,540 tonnes in 2004), where water quality is poorer, than in Kpong (where only 428 tonnes were used in 2004). The high chemical costs are regarded a barrier to the production of high quality drinking water, as all chemicals are imported. The total cost for chemicals in 2004 was 20,400 USD per million m^3 produced drinking water. (Lundéhn and Morrison, 2007).

Distribution network

The Accra distribution system is divided into three pressure zones:

- The Low Pressure Zone covers areas with ground elevations generally between 0 and 30.5 m. It covers the largest supply area of Accra and covers the main commercial, administrative and industrial areas and some of the largest residential areas. The LPZ is controlled by the water levels in the Weija works storage facilities to the west, in the Accra terminal reservoir (altitude 73 m) to the north and in the mile four reservoir (altitude 57 m) in the centre. It is the largest and most extensive distribution zone in the Accra Supply System.
- The Medium Pressure Zone covers areas with elevations generally between 30.5 and 61 m. The MPZ is theoretically controlled by the MPZ reservoir (altitude 97 m). When this reservoir is not in service the MPZ is supplied directly from the HPZ booster station.
- The High Pressure Zone, generally covering areas above 61 m in elevation, is controlled by the HPZ Reservoir (altitude 137 m). (Sarpong and Abrampah, 2006; Columbia University, 2003)

From the new Kpong plant, a high-lift pumping station delivers treated water via a 54 km long pipeline (1,050 mm diameter) to the Tema terminal reservoir, a storage tank in the north of Tema. The maximum output of this station is about 172,800 m^3/day. From the Tema terminal reservoir, the water is pumped by the Tema booster station through a 22.6 km long steel pipeline (800 mm diameter) to the Accra reservoir. The maximum output of the Tema booster is about 99,600 m^3/day. The Tema terminal reservoir also supplies the following, directly by gravity via a series of pipes: the town of Tema (via a 1,050 mm diameter line), the central area (via a 400 mm diameter line passing through the Old Tema reservoir of a capacity of 11,365 m m^3), and the east of Tema and eastern areas.

The Accra terminal reservoir supplies the Accra Low Pressure Zone by gravity via an 800 mm diameter main pipe and also feeds the Okponglo booster station. This station has two different sets of pumps that supply, respectively, the Medium Pressure Zone with its balancing tank at Okponglo and the High Pressure Zone via the Legon University service reservoir. The supply mains between Kpong and the Tema and Accra terminal reservoirs were highly corroded both externally and internally in 2003, compromising their reliability. (Columbia University, 2003)

Getting water from Kpong poses a challenge because of the distance and flat topography between the Volta lake and Accra. The cost of production is raised by the energy cost to pump the water in several points to maintain a pressure in the pipes. Energy consumption is higher from Kpong than from Weija, due to the long pumping distance to Accra whereas distribution from Weija is based on gravity. The total energy consumption for water production and distribution in 2004 was 101,900 MWh (842 Wh/m^3) (Uusitalo, 2002). The all inclusive costs of water production, including the use of chemicals and pumping, is much lower at Weija (0.10 GHC/m^3) compared to water from Kpong (0.22 GHC/m^3) (personal communication Michael Amuaka, 2008).

Water delivery

GWCL/AVRL provides direct services to people with a domestic connection. In addition, it provides piped water to private service providers like water vendors (standpipes), tanker services and sachet and bottled water producers. It also provides water to industries and private and governmental institutions. The table below gives an overview of the number of main water supply clients for each of the three GWCL-AVRL regions in the Greater Accra Metropolitan Area (for the full overview of clients and water use, please see annex 6).

Table 7: Average number of AVRL clients in 2007

Area	Tanker services	Metered household connections	P'stand unmtd	Standpipe mtd	Sachet water producer	Bottled water producer	Commercial sales	Industrial sales	Institution (private)	Institution (gov't)
Accra East	1	57,342	1	73	0	1	11,869	58	453	1,057
Accra West	9	56,329	1	40	0	0	6,515	65	653	336
Tema	4	40,647	0	201	218	3	7,513	95	258	488
Total GAMA	14	154,318	2	313	218	4	25,897	218	1,364	1,880

Source: AVRL, 2008 (data 2007)

The preferred water delivery option under this model is the household connection, supplying eight to 15 people per connection. The (design) amount of water to be delivered by GWCL/AVRL to household connections differs over the different income groups, as can be seen in the table below.

Table 8: GWCL design parameters

Income Group	Per Capita consumption (lpcd)	Average Resident population	Household size	Average monthly consumption (m^3 / month)
High Income	120	8	1	28.8
Middle Income	90	12	2	32.4
Low Income	60	15	>3	27

Source: GWCL, 2006 (GWCL Planning and Development Unit, (2006). Design parameters. Planning and development document for GWCL, Accra)

Many upper and middle income households have installed private water storage tanks in order to better cope with irregular water supply. In addition, according to GWCL/AVRL, hotels and households have installed inline booster pumps to increase the pressure from their taps. GWCL/AVRL claim that this contributes to reduced pressure in parts of the system. These pumps have been forbidden by GWCL. GWCL and AVRL have been seriously trying to track down the location of inline boosters and confiscate them.

5.1.2 Private independent systems

Besides private service providers using the GWCL as the source of water, either directly or indirectly, a limited number of Small Scale Independent Producers (SSIP**)** operate in GAMA, capturing, treating and distributing water from alternative sources. An example of this is a number of water kiosks, implemented by the NGO WaterHealth Ghana. These systems have either a capacity of 65,000 litres serving 3,000 people with 21 lpcd, or a capacity of 21,000 litres serving a population of 1,000 people (Puplampu, 2009).

5.1.3 Community managed water supply systems

There are four community managed piped water supply systems within the GAMA area, implemented under the Community Water and Sanitation Agency (CWSA): Abokobi, Pantang, Oyibi and Azhaaladza (see Figure 18). These are generally relatively small piped systems, supplied by a borehole with a yield of 45-50 m^3/hour (Pantang and Abokobi respectively) and an actual production of about 100,000 m^3 per year. The boreholes that supply these systems are thus generally not used to their full capacity (in Pantang the water produced was 24 percent of the borehole capacity, while this was 27 percent in the case of Abokobi) (Ampadu, forthcoming). An overview of the technical details and the performance of the Abokobi and Pantang system can be found in Annex 7.

For community managed small town systems, the recommended amount of water use per capita, per day is 60 lpcd for people with access to household connections and 20 lpcd for people getting water from standpipes. In addition, industrial and commercial demand is assumed to be 10-20 percent of the domestic demand and physical losses are assumed to be 8-10 percent (10-15 percent in case of rehabilitated pipelines) (CWSA, 2004). The number of people per standpipe should not exceed 300 persons per spout and the maximum walking distance should be 500 meters (CWSA, 2007).

Through the community managed system, water is generally provided to a number of standpipes and household connections. In Abokobi, water is supplied to 21 public standpipes and 374 household connections. There are 22 public standpipes and 267 household connections in Pantang.

5.2 Current and future demand for water supply services

Various estimates on water demand can be found in different documents. The different estimates use different amounts of water requirements per person per day and different population sizes as a basis, as can be seen in the table below.

Table 9: Water demand estimates for the GAMA area from various sources

Source	Year	Demand (m^3/day)	Based on

TAHAL, 2008	2007	474,465	Population of 3,705,136 @average 54 lpcd in the rural areas and 139 lpcd in the urban areas (see annex 8 for complete overview)
Kessie, 2007	2007	456,000	Population of 3,050,000 @ 150 lpcd
Awuah, 2007	2007	408,727	Personal communication GWCL 2007
Smit, 2007	2005	364,384	Domestic demand: 191,781 (pop 3,000,000, @ 64 lpcd), commercial and industrial demand: 82,192 (23%) and 25% leakages)

The reviewed and updated SIP (TAHAL Group, 2008) estimates the water demands for ATMA by extrapolation of the values adopted by the SIP 1998, which were based on data on water production, water consumption by domestic, institutional, commercial and industrial consumers. See table below.

Table 10: Per capita water demand adopted in the SIP Review

Year	2005	2011	2015	2020	2025
lpcd	138	141	143	144	145

Source: TAHAL Group, 2008

Based on the per capita demand and the population forecast as used by the SIP Review, the reviewed and updated SIP (TAHAL Group 2008) came up with the water demand projection as displayed in Table 12.

This table also gives the projected water demand using three additional scenarios, based on three population growth scenarios as presented in chapter 2, and based on different projections of economic growth. These scenarios are:

- A “high water demand” scenario with maximal population growth and higher water demands caused by economic growth
- A “medium water demand” scenario with medium population growth and economic growth, resulting in an increase of in water demand
- A “low water demand” scenario with minimum population growth and no economic growth

For the scenario without economic growth, we assume a steady total water demand of the equivalent of 130 lpcd (based on a well-off population of 73 percent of the total population with a demand of 150 lpcd, and a poor population of 27 percent poor, with a demand of 75 lpcd[10]). For the cases with economic growth, we estimate an increase in the proportion of the population with a higher daily water demand rate. The table below gives an overview of the estimated equivalent per capita water demand in the three scenarios.

Table 11: Per capita water demand adopted for this study

	2007	2011	2015	2025	2030
Without economic growth	130	130	130	130	130
With economic growth	130	133	135	142	145

This does not mean, however, that this is the amount of water that households will receive, as this amount includes physical losses in the system and water use for industrial and commercial use. Estimating physical losses to be 20 percent, and estimating the industrial and institutional used to be

[10] According to Sarpong Manu and Abrampah (2006), water requirement rates that should be used in the design of urban systems are 75 to 150 lcpd.

about 25 percent, the amount of water available for households will be about 41 lpcd for poor and 83 lpcd for rich households. Increases in per capita water demand can thus both be due to increased water use at the household level because of increased wealth, but also to rise in industrial and commercial water demands.

The projected water demands according to these three scenarios and according to the revised SIP are presented in the table and graph below.

Table 12: Water demand estimation for GAMA (m^3/day)

	2007	2011	2015	2025	2030
High water demand scenario (max pop growth, economic growth)	510,967	652,094	840,127	1,652,499	2,371,666
Medium water demand scenario (medium pop growth, economic growth)	480,402	584,345	710,502	1,156,411	1,474,128
Low water demand scenario (min pop growth, no economic growth)	447,924	513,178	587,939	826,023	979,089
Scenario from SIP review	474,465	554,988	647,363	931,746	

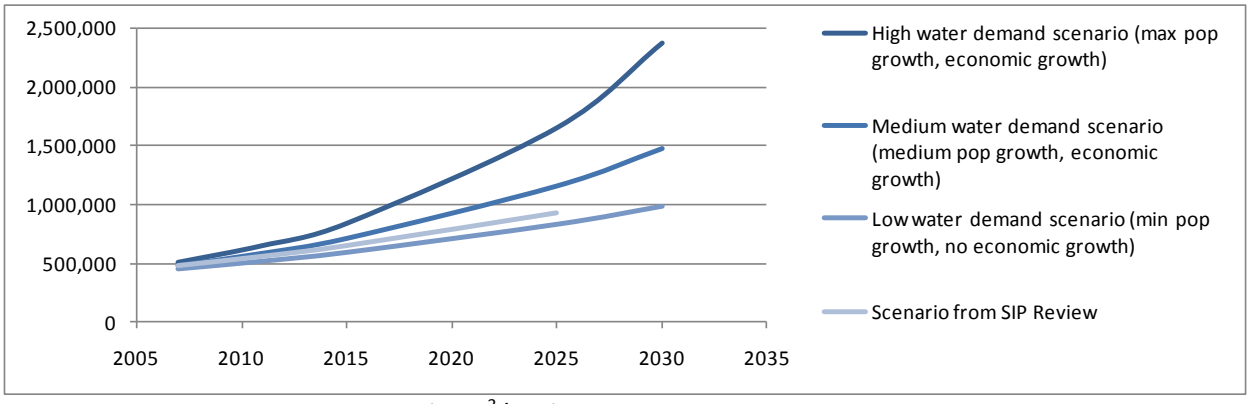


Figure 21: Projected water demand (in m^3/day)

Taking into account economic growth, the water demand will grow more than the population growth. The table below shows that in the high water demand scenario, the demand will increase to 4.6 times the estimated 2007 water demand, or more that 6.5 times the amount of treated water that was actually produced in 2007. In the low water demand scenario, demand will increase by a factor of 2.2 and by a factor of 2.7 related to the 2007 water demand and the amount of treated water produced respectively.

Table 13: Projected 2030 water demand increase

Water demand (m^3/day)	% of 2007 demand	% of 2007 production
High water demand scenario (max pop growth, economic growth)	464%	652%
Medium water demand scenario (medium pop growth, economic growth)	307%	406%
Low water demand scenario (min pop growth, no economic growth)	219%	269%

5.3 Access to water supply services

This section describes access to different water supply services and the barriers that people face. The services provided by GWCL, intermediate providers, small scale independent providers and community managed service providers are described in terms of quantity and quality of the supplied water and accessibility and reliability of the services. Furthermore, actual consumption and user costs for the different water services are analysed and presented.

5.3.1 Access to the GWCL system

Water use from the GWCL water services

The total amount of GWCL water sold[11] in GAMA in 2007 was 53,718,987 m^3 (147,175 m^3/day). Divided over the projected number of GAMA inhabitants in 2007, this amounts to an average of 37 to 43 litres per capita, per day. Of this, a bit more than half was sold from domestic metered taps, as visualised in the graph below. The rest was mainly sold for commercial (including tanker operators), industrial and institutional use. Minor qualities were sold to bottled water producers, sachet water producers and metered and unmetered standpipes.

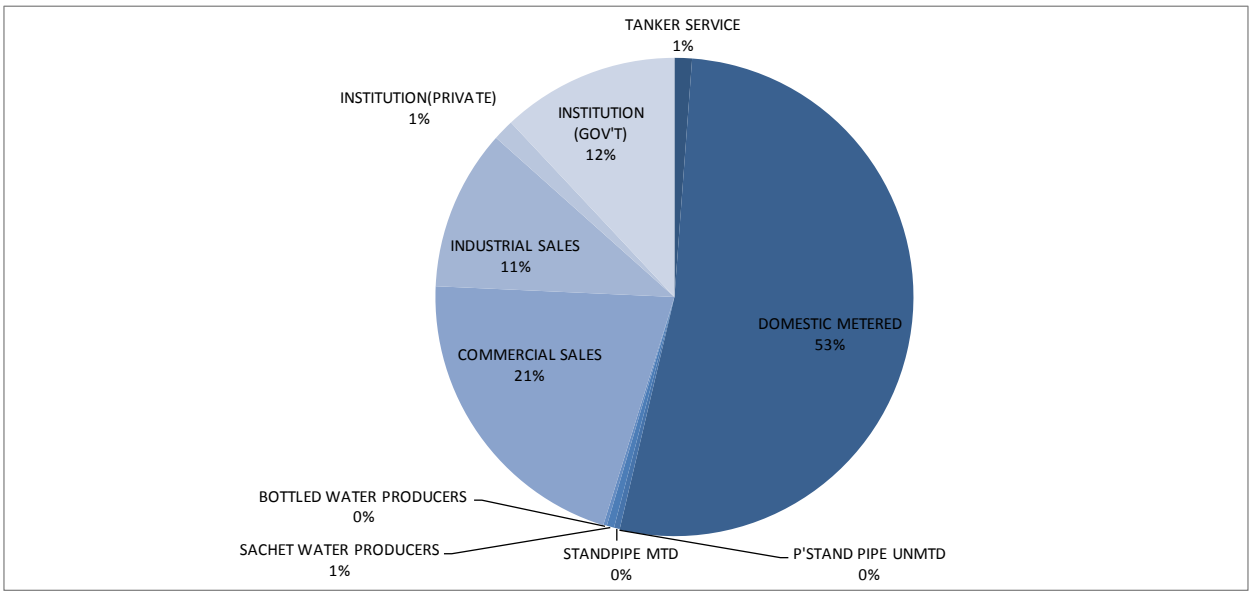


Figure 22: Water use from GWCL/AVRL
Source: AVRL 2008, data from 2007

The amount of water sold was about 40.5 percent of the amount of water actually produced in 2007, which means a non revenue water rate of 59.5 percent. Non revenue water is caused by both physical losses, estimated by Lievers and Barendregt (2009)[12] to be 45 percent of the total non revenue water, as well as economic losses, estimated to be 55 percent of the total non revenue water. Commercial losses are thus estimated to amount to about 33 percent of the actual produced water and the physical losses to about 27 percent.

Subtracting the physical losses from the amount of water produced gives an indication of the amount of water actually used in the city, whether officially sold or not. In 2007, this was 97,152,814 m^3 (266,172

[11] See annex 6 for details
[12] based on unpublished 2009 AVRL data

m^3/day), or an equivalent of about 68-77 litres per GAMA inhabitant, per day. Part of this water was sold for industrial and commercial uses. Subtracting the amount used for commercial and industrial uses, leaves 80,065,198 m^3 (219,357 m^3/day), or the equivalent of 56-64 litres per GAMA inhabitant, per day. This is the estimated average amount of GWCL supplied water used per person for domestic uses. The table below gives an overview of these figures[13].

Table 14: Water production, sale and use in GAMA (2007)

	Amount of water (m^3)	Amount of water (m^3/day)	Lpcd, according to max pop growth scenario	lpcd, according to min pop growth scenario	% of amount of water produced
Produced	132,689,581	363,533	92	106	
Sold	53,718,987	147,175	37	43	40%
Non Revenue Water (= produced - sold)	78,970,594	216,358	55	63	60%
Commercial losses (= 55% of NRW)	43,433,827	118,997	30	35	33%
Physical losses (= 45% of NRW)	35,536,767	97,361	25	28	27%
Delivered (=produced - physical losses)	97,152,814	266,172	68	77	73%
Domestic use (=delivered – amount sold for commercial use - amount sold for industrial use)	80,065,198	219,357	56	64	60%

Source: Based on data from AVRL, 2007 database

The table below presents the water use per connection for household connections and metered and unmetered standpipes, showing an average water use of 501 litres per household connection. Assuming an average number of people per household connection of 10, average consumption would be 50.1 lpcd. However, as mentioned in chapter two, many people in GAMA live in compound housing, often sharing a single household connection with 20-50 people. The amount of water sold per unmetered standpipe indicated in the table below, is enough to provide 20 lpcd to 58 people, while the amount of water sold per metered standpipe is sufficient to provide 91 people with 20lpcd. As this seems very low, it could be questioned how reliable this data on standpipes is, which suggests more research is needed.

Table 15: Average water use per connection (litre per day)

GWCL/AVRL region	Domestic metered	Unmetered stand pipe	Metered stand pipe
Accra East	425	1793	317
Accra West	566	0	2090
Tema	518	0	2332
ATMA (GAMA)	501	1,160	1,832

Source: AVRL, 2007 database (based on average 2007 monthly water use per connection)

[13] It should, however, be mentioned that the accuracy of the estimation of the amount of water sold is low because of a lack of working domestic meters. About 55 percent of the billed customers are billed on flat rate, rather than on actual amount of water consumed. (Lievers and Barendregt, 2009)

There are big differences in the amount of water used between households from different wealth classes. Based on customers' consumption information from 2004 – 2008[14], Lamptey (2010) analysed domestic water consumption for households from different wealth classes, with household connection to the GWCL system with different flow conditions, ranging from continuous flow to intermitted poor flow in Accra East. The table below presents his findings. It shows a wide range in actual water consumption, ranging from 138 lpcd for high income households with continuous flow conditions, to 43 lpcd for poor households with poor intermitted flow conditions.

Table 16: Per capita consumption in income groups under different flow conditions

Income group	Flow condition		
	Continuous	Intermittent Good	Intermittent Poor
High Income	138 l/c/d	110 l/c/d	75 l/c/d
Middle Income	90 l/c/d	83 l/c/d	54 l/c/d
Low Income	66 l/c/d	56 l/c/d	43 l/c/d

Source: Lamptey, 2010

Households using water for small enterprises use more water than people using water for domestic uses only. Based on a number of interviews with small entrepreneurs, Abraham et al *(*2007) estimate that depending on the size of the enterprise, households may use 30-400 litres per day of additional water for productive uses. The table below gives an overview of a variety of productive uses of water.

Table 17: Productive uses of water in Accra

Description of enterprise	Water use (litres/day)
Tea and beverage	34 – 140
Chop bar	170 – 370
Restaurant	1000
Beauty salon	200 – 400
Livestock	220 – 350

Source: Abraham et al, 2007

Water quality of the GWCL water services

The quality of water supplied by GWCL can generally be considered good. However, Lulani et al (2008) identified a number of incidents in both the treatment and distribution systems that have a negative effect on the water quality. At the treatment plant level, these incidences include power outages, algae clogging filters, inadequate disinfestations, filter backwashing problems and no coagulation. In addition, contamination in the distribution system and pollution entering part of the system without pressure were identified as having a negative effect on water quality.

Reliability of the GWCL water services

Water supply from GWCL is irregular and unreliable in a big part of GAMA. According to Yepes et al (2000), GWCL has been rationing water on a trial-and-error base since 1996. The rationing programme is executed by the distribution officer, who operates valves to direct water to communities during the rationing. However, Lamptey (2010) notes there are circumstances where the officer forgets to re-direct the supply to certain areas. According to GWCL/AVRL management, the rationing programme is

[14] Based on 800 service accounts, randomly selected from 11,000 domestic customers. Source: Processing Unit of Accra East Region of GWCL/AVRL.

disrupted as well by private water filling points in the distribution areas, as they disturb the service pressure during the rationing period.

The figure below shows the current (2008) areas with good, intermediate, rationed and no or poor water supply from GWCL in GAMA. The figure shows that areas closer to the pipelines have generally better access to good water supply from the utility. The areas on the fringes of Accra are worst off, having little reticulation and no-to-poor water supply. The Teshi Nungua area is located at the end of both the pipes coming from Weija, as well as the one coming from Kpong. As illustrated in this figure below, this area is affected by no-to-poor water supply as well.

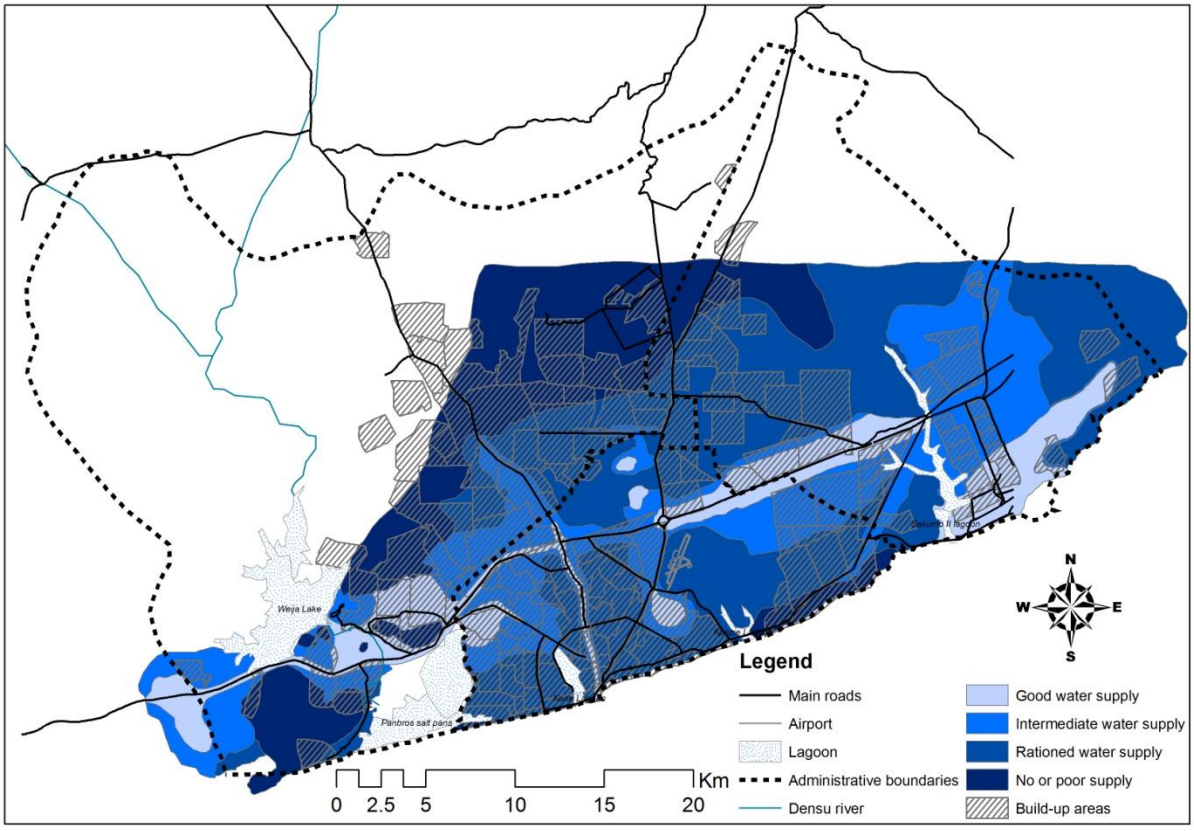


Figure 23: GWCL/AVRL water supply services in GAMA
Source: AVRL GIS unit, 2008

A number of studies have been done on the reliability of water supply from GWCL. The table below gives an overview of the results of some of these studies.

Table 18: Availability of water supply from GWCL

	% of population			
Source: / Frequency of availability of water	Nii Consult (2003)	WaterAid (2005)	Lundéhn and Morrison (2007)	Nyarko, Odai, Owusu and Quartey (2007)

Every day	30	25	9.4	17
5-6 days per week	30	75	90.6	6
3-4 days per week				16
2 days per week	25			33
1 day per week	15			
No water				7

Lamptey (2010) presents data on planned and actual water supply in seven high income, seven middle income and seven low income areas in Accra East with rationed water supply, as summarised in the table below. This suggests that although high income areas are scheduled to receive water over longer periods than the low income areas, in reality they received water for slightly shorter periods than the low income areas.

Table 19: Reliability of GWCL water supply (in East Accra)

	Planned supply		Actual supply		
Type of area	Hours/month	% of month with planned water supply	Hours/month	% of month with actual water supply	% of planned
High income area	507	69%	145	20%	29%
Middle income area	398	54%	171	23%	43%
Low income area	233	32%	211	29%	91%

Source: Lamptey, 2010

It could be concluded that high and low income areas experience almost the same level of unreliability of GWCL water supply. However, households in high and middle income areas are likely to cope better with the unreliability of water supply, as they often have storage tanks in which they capture and store water to be used in times of rationing.
In order to be connected to the GWCL-AVRL network, consumers have to pay connection costs. These amount to GH¢80-100 (Eguavoen and Spalthoff, 2008) per connection (which amounts to GH¢8-¢10 per person, assuming an average number of people per connection to be 10). Other investment costs can include the installation of a water tank, starting from GH¢120 for an 800-litre tank (MIME Consult, 2004), and / or a booster pump which amounts to about GH¢300-800. The connection procedure requires that that the client is able to provide proof of ownership of the property to be connected, which makes it difficult for tenants to get connected.

Users connected to the GWCL network pay a water tariff according to the amount of water used. Consumers either pay a flat rate or according to an increasing block tariff, displayed in the table below as determined by PURC (see Box 3). A compound house connected to the piped network with 12 people, each using 60 lpcd, will use more than 20 m^3 per month and will thus have to pay according to the higher tariff.

Table 20: Water tariffs 2008

	Monthly charges (in GH¢ per 1 m^3)
Domestic (metered)	0-20 m^3 (lifeline tariff) = 0.66

	>20 m^3 = 0.91
Metered public standpipes	0.66
Commercial/industrial/private/public institutions	1.10
Special commercial rate	2.04

Source: PURC, 2009

The special commercial rate is applicable to industries that use a lot of water, like water bottling companies, coca cola etc. Tanker operators pay the commercial rate at the filling points. Sachet water producers are supposed to pay a commercial rate as well.

Box 3: Regulation of water service providers

The Public Utilities Regulatory Commission (PURC) is responsible for the economic and drinking water quality regulation for GWCL water supply services. It is also responsible for the approval of rates chargeable for the provision of utility services, including electricity and gas. The commission was established by the Public Utilities Regulatory Commission Act, 1997, Act 538. It is an independent body (section 4 of the Act 538) and is not subjected to direction or control of any authority in the performance of its functions. For administrative purposes, however, PURC falls under the Office of the President. Members of the PURC include civil society representatives, including representatives of the Trades Union Congress (TUC) and the Consumer Association in Ghana. This brings up the question of how much strength do consumers have and whether they are aware of what the influence they have as members of the PURC.

The key functions of the PURC include:

- the provision of guidelines on, and the examination and approval of rates chargeable for, provision of utility services
- the protection of the interest of consumers and providers of utility services
- the promotion of fair competition among public utilities
- the initiation and conduct of investigations into standards of quality of services given to consumers
- monitoring the standards of performance for provision of services

By its mandate, the PURC is responsible for tariff setting and regulation of services provided by GWCL, but in practice GWCL proposes the tariff for the PURC to endorse. GWCL regulates its own standards for the quality of service and PURC only conduct investigations based on complaints. This is to ensure accountability of the utility to the consumer. This is supported by regulations known as the Public Utilities (Complaints Procedure) Regulations, 2000, LI 1665, which came into force in January 2000 after the due parliamentary process. The regulations give the opportunity to any person with a complaint against GWCL to complain to the PURC. The PURC, however, encourages complainants to first deal with GWCL themselves. Rather than filing a complaint with the PURC, it seems that most consumers choose to air the grievances through the media.

Even though the PURC is aware of the existence of secondary and tertiary providers, they are neither formally recognised nor registered. They are also not well organised. Recently, however, tanker guidelines (2008) have been developed for members of the tanker associations to regulate the quality of water supplied.

In areas not supplied by GWCL but by systems under community management, Water and Sanitation Development Boards, set their own tariffs, which are then approved by the respective district or municipal assembly.

5.3.2 Private intermediary (secondary and tertiary) service providers

As mentioned above, a large part of people living in GAMA depend on alternative service providers as they lack direct access to the GWCL system. The majority of these alternative service providers depend on GWCL as their source of water, either directly, or indirectly. Here, we will have a closer look at these intermediary service providers and the services they provide.

Domestic vendors sell water from storage tanks built either underground or on overhead polythene tanks. The storage volume ranges from 1,000 gallons to 5,000 gallons (3.8-18.9 m^3). Water is bought from tankers and sold directly to households, who collect water in 18 or 20 litre containers. The vendors are mostly women and are often low income earners who rely on this as a main source of livelihood (Sarpong Manu and Abrampah, 2006). Domestic vendors can mostly be found in densely populated, low class and indigenous areas, within the reach of the tanker services. Unlike domestic vendors, neighbourhood sellers do not rely on tanker services, but sell water from the GWCL mains directly. Neighbourhood sellers can mostly be found in densely populated, low class and indigenous areas, within the reach of the GWCL system. GWCL does not recognise domestic vendors and neighbourhood sellers, as they consider these vendors to be partly to blame for the inability of some residents to get their supply. (Sarpong, Manu and Abrampah, 2006)

The reliability depends on the reliability of the tanker or GWCL supply and the storage capacity of the vendor or seller.

People depending on domestic vendors and neighbourhood sellers generally use less water than people connected to the GWCL system. Abraham et al (2007) estimate water use for these people to be 25-60 lpcd. Field data from a study done by Sarpong Manu and Abrampah (2006) suggests a poor household uses about 180 litres per day, which would only be about 18 lpcd, assuming a household size of 10 persons.

Sarpong and Abrampah (2006) mention there are quality concerns related to the fact that water is handed over at various points (network – tanker- vendor-client), which all pose potential points of contamination.

The vending points are only accessible during opening hours when people often have to queue for long periods of time. The costs of fetching water from neighbourhood vendors vary depending on the area. Van Rooijen et al (2008) found water fees per m^3 in Sukura and Old Fadama to be about 3 and 6 GH¢/m^3 respectively (which is 4-9 times the price of piped water supply). This difference in price is influenced by the fact that Sukura is a formal low income settlement with some water supply infrastructure, while Old Fadama is an informal settlement where connections to the utility are officially not permitted. There is a monopoly amongst private vendors and prices are agreed upon. In times of scarcity, especially during the dry season, the price in Old Fadama goes up to about 11.5 GH¢/m^3 (18 times the official price for domestic users). (Van Rooijen et al, 2008)

In order to lower the prices from domestic vendors supplied by tanker services, AVRL piloted tanker service supply in a number of areas in Accra with poor water supply. These areas included Osu, La Central, Dome, Taifa and Kwabenya. Water was sold to the AVRL tankers at the subsidised rate of 1.14 GH¢/m^3, while other tankers buy at 2.03 GH¢/m^3. At the vending points supplied by the AVRL water tankers, water was sold to consumers at 0.05 GH¢ per 20 litres (2.50 GH¢/m^3), as opposed to the fees of 0.10 to 0.20 GH¢ per 20 litres (5 to 10 GH¢/m^3) charged by other vendors in the area (Tuffuor, 2009). However, the desired effect of lowering vendor prices was not achieved. People continued to patronise the more expensive water vendors if they were located closer to the house. Distance and convenience seemed to play a more important role than price in deciding from where to buy. (Tuffuor, 2009)

Tanker services supply water to households directly and to other intermediary service providers. The size of the tanker trucks range from 1,200 to 3,500 gallons (4.5 to 13.3 m^3) and in very exceptional cases 4,000 and 4,500 gallons (15.1-17.0 m^3). The tankers are owned by individuals who for operational purposes have formed associations (see annex 9 for an overview of tanker associations). In 2006, there were seven major associations operating, serving the areas indicated in the figure below. Tanker associations have a formal relationship with GWCL (Sarpong Manu and Abrampah, 2006). Some tankers operate independently and some take water illegally from sources of disputable quality, creating a health risk for the people that they serve. In 2008, PURC launched its 'Tanker services guidelines' in order to provide guidelines for the safe and affordable supply of water by water tankers.

Tanker services deliver water to the storage facilities of individual households. The amount of water supplied depends on the storage capacity of the household. Owusu Kanin (2010) found that high income households mostly buy water in quantities of 3,000 gallons to 4,500 gallons, while middle income households generally buy 2,000 gallons and 3,000 gallons. According to his calculations based on

user data, high income households supplied by tanker trucks use on average 149 lpcd, middle income households 101 lpcd and the low income 51 lpcd.

The quality of the water depends on quality of water at the source and on operation and maintenance of the tanker and household tanks. (Sarpong and Abrampah, 2006)

Tariffs charged by tanker operators are supposed to be determined through consultations between PURC and the Tanker Associations and should be based on distance and bear reference to bulk haulage rates provided by the State Transport Corporation or Ghana Private Road Transport Union. Tariffs should be published by the associations at filling points and in the media for the benefit of consumers. Owusu Kanin (2010) found that prices paid for tanker services differed between high and low income households, with high income households paying about 5.17 GH¢/m^3, middle income households paying about 5.3 GH¢/m^3 and low income households paying about 7.2 GH¢/m^3. He attributes this difference to the fact that high income households are able to buy water in larger quantities than poor households.

Sachet water is a popular source of drinking water and abundantly available for sale in shops and on the street throughout GAMA. It is produced by a large number of sachet water producers, many of whom can be found in Tema. They obtain water either from the tanker trucks or directly from the utility mains. Water is filtered, sealed in 0.5 litre polythene plastic sachets, and sold to retailers who resell them either individually or in 30 piece packages. The popularity of sachet water can be seen as an indication of the lack of public confidence in the quality of the water supplied by GWCL (Sarpong Manu and Abrampah, 2006). The quality of sachet water is generally considered to be good, even though there is evidence that some sachet water produced actually delivers water of lower quality than that of the utility. Kwakye-Nuako et al (2007) mention a study on 27 different sachet brands that found the presence of pathogenic parasitic organisms in 77 percent of the cases. Sachet water is sold at 0.05 GH¢ per 0.5 litre bag (100 GHC/m^3) or at 1 GH¢ per 30 bags (67 GH¢/m^3).

5.3.3 Independent private producers

Water Health Centres can be considered independent private producers (managed in partnership by WaterHealth and the community), not connected to the GWCL network. Four of these Water Health Centres can be found in the North Western part of GAMA (see Figure 18). The centres are designed to supply 20 lpcd. The quality of water produced by these centres is high. The centres are accessible during operation hours when water can be fetched from these centres by bucket or basin. Based on the data from the Pukuase Health Centre, as presented by Puplampu (2009), the average amount of water used was only about 3 lpcd in during the first half of 2009. As this amount is insufficient for all (domestic) uses, the service was probably only used for a limited number of (domestic) uses, mostly drinking. Other sources are used for activities like washing and doing laundry.

The costs of fetching water from a Water Health Centres is 0.10 GH¢ per 20 litre (5 GH¢/m^3) (Puplampu, 2010), which is significantly more than water provided though the utility or community managed systems under CWSA (see below).

5.3.4 Independent community managed water supply

In the community managed systems in the peri-urban communities of Abokobi and Pantang the average capita water use was found to be about 15 lpcd and 11 lpcd respectively (Ampadu, forthcoming). However, the amount of water used seems to differ greatly between people with access to standpipes

and people with household connections. The average amount of water sold from the standpipes was 4-6 lpcd (in Pantang and Abokobi respectively). This would mean that the vast majority of households depend on alternative sources for their water supply, like nearby streams and dugouts. The average amount of water consumed from each household connection was estimated to be about 307 and 374 l/day for Abokobi and Pantang respectively, which would roughly be 31 and 37 lpcd, assuming an average household size of 10 people (for details see annex 7). The non revenue water rate in the small community managed systems Abokobi and Pantang amounts to about 42 percent and 40 percent respectively, which is lower than the non revenue rate of the utility managed system. (Ampadu, forthcoming)

The tariff in the community managed systems of Abokobi and Pantang has been set at 0.03 GH¢ per 18-litre bucket (1.66 GH¢/m^3). In addition to the water fees, the community had to contribute five percent of the total capital investment costs before the implementation of the system, in accordance with the National Community Water and Sanitation Programme, under which the systems have been implemented. Bismark (2009) found capital investment costs of community managed systems in the Greater Accra Region to range between 58 to 150 Ghana cedis per served capita (using 2008 as the common base year), which, assuming five percent community contribution, would amount 2.9 to 7.5 GH¢ per capita. However, as indicated by Nyarko et al (2007), the community contribution was reduced to 2.5 percent due to concerns about the ability to pay by small towns and seems to have been abolished since.

5.3.5 Overview of costs of water services

As illustrated in the figure below, consumers who rely on alternative providers generally pay much more per unit of water fetched than people connected to the utility.

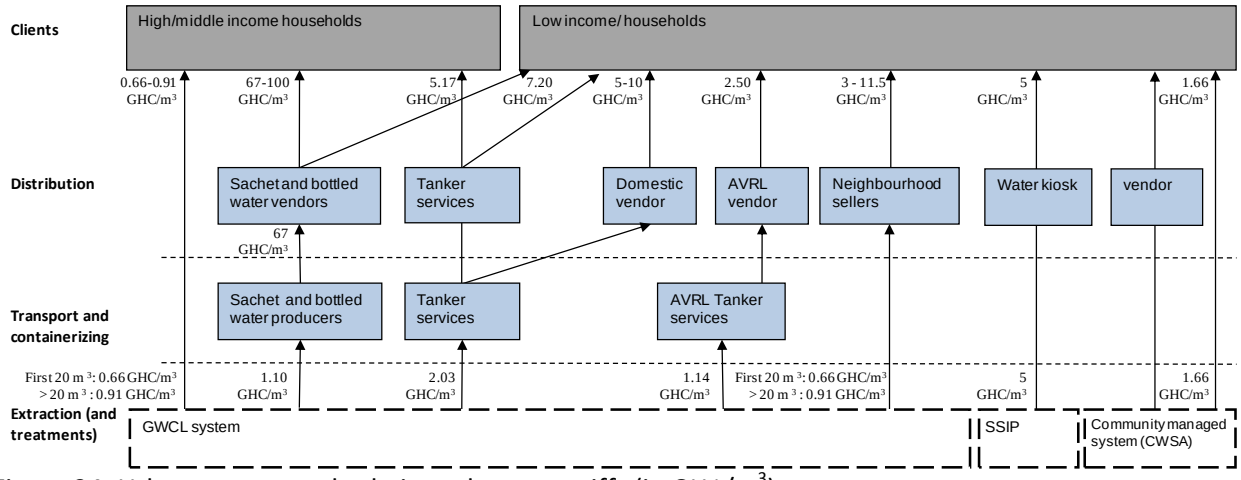


Figure 24: Urban water supply chain and water tariffs (in GH¢/m^3)

The table below gives a summary of the different service providers. It shows the quantity of water used per capita, per day, the tariff and the average monthly expenditure on the services of high and low income households receiving water from the different service providers. This is visualised on the figure below.

The table shows that low income households tend to spend more on water supply than high income households. For example, a high income household with a GWCL household connection, using between 75 and 138 lpcd, paying 0.66 GH¢ per m^3, spends between 1.49 and 2.73 GH¢ per capita per month (providing the total amount of water used is less than 20 m^3 per month). A low income household depending on a water vendor, using only 25 to 60 lpcd, paying between 3 and 11,5 GH¢ per m3 of water, will spend between 2.25 and20.70 GH¢ per capita, per month.

It also shows that people with household connections or using tanker services consume a considerably higher amount of water than people who depend on other service providers. Water use from community managed standpipes and independent water kiosks is not sufficient to cater for all (domestic) uses, which means households depending on these service providers also have to use other sources of water to satisfy their daily water demands. The table also shows that in many cases low income households pay more for less water, especially when they depend on vendors or neighbourhood vendors.

What is not reflected in this table is the fact that people in compound houses tend to share one connection, using a total amount of water exceeding 20 m^3 per month, thereby paying a higher tariff.

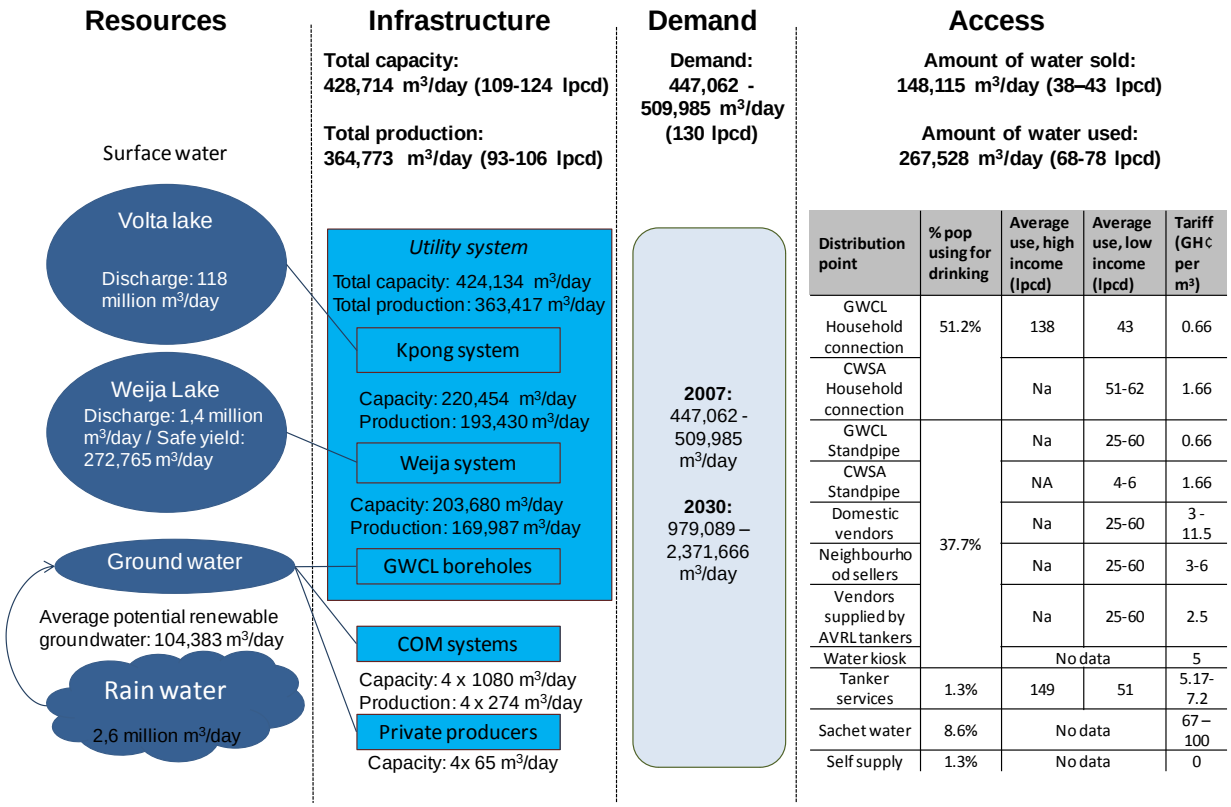
Table 21: Overview of access to distribution points

Type of distribution point	% Pop with access (source: GSS 2008)	Distribution point	Quantity of water used, high income, min (lpcd)	Quantity of water used, low income, max (lpcd)	Tariff (GH¢/m^3)	Average monthly expenditure, high income (GH¢ / capita)	Average monthly expenditure, low income (GH¢/capita)
Household connection	51.2%	GWCL household connection	75 - 138	43 - 66	0.66	1.49-2.73	0.85 - 1.31
		Household connection community managed system	-	51-62	1.66	Na	2.54 - 3.09
Vendor	37.7%	GWCL standpipe	-	25-60	?	Na	?
		standpipe community managed system	-	4 - 6	1.66	Na	0.2 - 0.3
		Domestic vendors	-	25 - 60	3-11.5	Na	2.25 - 20.70
		Neighbourhood sellers	-	25 - 60	3-6	Na	2.25 - 10.8
		Vendors supplied by AVRL tankers	-	25 - 60	2.5	Na	1.88 - 4.50
		Independent water kiosk (Water Health)	-	3	5	Na	0.3
Tanker service	1.3%	Tanker services	149	51	5.17-7.20	23.11	11.02
Sachet water	8.6%	Sachet water	No data	No data	67 - 100	No data	No data
Self supply	1.3%	Self supply	No data	No data	No data	No data	No data

5.4 Current and future water supply challenges

The figure below gives an overview of the water Resources and water supply Infrastructure, Demand and Access (RIDA). It shows that at the moment the availability of water resources for the supply of water to the city of Accra is not a major issue. In the future, availability of water resources is not likely to be a major issue either. Even in the worst case scenario, with maximum decreased flow levels in the Volta and maximum upstream water demand, the average discharge of the Volta would be almost 25 km^3/year in 2025. Comparing this with the maximum 2030 GAMA water demand of about 0.866 km^3/year (2,371,666 m^3/day), this means that the maximum demand will only be 3.5 percent of the Volta discharge. However, the future lowering of water levels caused by climate change and the increase in upstream water use, could have a negative impact on the functioning of the current intake and treatment infrastructure at Kpong and on the costs involved in acquiring and transporting water from Kpong to the city of Accra.

The figure also shows that the vast majority of water produced to serve the Greater Accra Metropolitan Area (99.2 percent) is produced by the GWCL system.



Distribution point	% pop using for drinking	Average use, high income (lpcd)	Average use, low income (lpcd)	Tariff (GH¢ per m³)
GWCL Household connection	51.2%	138	43	0.66
CWSA Household connection		Na	51-62	1.66
GWCL Standpipe	37.7%	Na	25-60	0.66
CWSA Standpipe		NA	4-6	1.66
Domestic vendors		Na	25-60	3 - 11.5
Neighbourhood sellers		Na	25-60	3-6
Vendors supplied by AVRL tankers		Na	25-60	2.5
Water kiosk		No data		5
Tanker services	1.3%	149	51	5.17-7.2
Sachet water	8.6%	No data		67 – 100
Self supply	1.3%	No data		0

Figure 25: Overview of the 2007 water supply situation in the Greater Accra Metropolitan Area.

Looking at this figure, a number of challenges become apparent:

- The water demand is higher than the capacity of the systems providing services to GAMA (the design capacity was 84-96 percent of the 2007 demand, while the 2007 production was 72-82 percent of 2007 demand)

- The systems are not used to their full (design) capacity (production is 85 percent of design capacity)
- The amount of non-revenue water is very high (59 percent)
- Low income households use less water than high income households but pay more per unit water

In addition, a major challenge as identified above is the reliability of the GWCL system. Below we will have a closer look at these challenges and their root causes.

5.4.1 Water demand is higher than the capacity of the system(s)

From the above, it is clear that in 2007 the estimated optimal water demand was slightly higher than the amount of treated water produced in the Greater Accra Metropolitan Area, which is estimated to be between 71 and 81 percent (depending on the population growth scenario) of the water demand in that year. The low supply is to some degree caused by the fact that the GWCL head-works are working under their capacity (for the Kpong system, production was 88 percent of the capacity in 2007, while this was 83 percent for the Weija system). Even when working at full capacity, the demand would slightly outweigh system capacity. However, the fact that the difference between water demand and production is relatively small, seems to suggest that on the short term, production capacity is not a major challenge. In the longer term, however, water demand is expected to increase considerably, due to population and economic growth (to between 2.7 and 6.5 times the 2007 amount of water produced by 2030 in the best and worst case scenario respectively). Therefore, the capacity of the system(s) supplying water to GAMA will have to be increased and / or the demand will have to be decreased.

5.4.2 High rates of non revenue water in GWCL system

More so than the discrepancy between water supply and water demand, the considerably larger difference between the amount of water produced and the amount sold in 2007 is cause for concern and short term action. As presented above, non revenue water was estimated to amount to about 59 percent of the amount of water produced. This was both due to physical losses, to which about 27 percent of the actual produced water was lost, as well as economic losses, which were estimated to be 33 percent of the water produced.

Physical losses in the system are to a large extent caused by the bad state of the distribution infrastructure. This is aggravated by the limited leakage detection system and a lack of bulk water metering within the system. The bad state of the distribution infrastructure can be attributed to lack of maintenance, replacement and rehabilitation. This is likely to be (partly) caused by the lack of financial resources available to GWCL, because of high commercial losses, uneconomical tariffs and the lack of investment by government and external donors in maintenance, replacement and rehabilitation (CapManEx).

Causes of the commercial losses include inaccurate recording of customer meters, inaccurate data recording, estimation and use of flat rate water rates, ineffective revenue collection procedures and illegal consumption and connections. The occurrence of illegal connections and consumption has a number of underlying causes. People struggle to get connected due to complicated procedures and legal boundaries. In order to get connected, proof of ownership has to be submitted to the utility. People living in rented houses, which was shown in chapter two to be almost 46 percent of the GAMA

population, are unable to do so and are therefore unable to connect. In addition to this, the connection costs are relatively high.

5.4.3 Low reliability of GWCL water services

As presented above, reliability of the GWCL water supply is a big issue for the population of Accra connected to the GWCL system. The low reliability is to a large extent caused by the fact that demand is higher than the supply, resulting in rationing of the water supply. Reasons for the low supply are diverse. These include low system capacity, high physical losses in the distribution system, stealing of water and the presence of in-line booster pumps which, according to GWCL/AVRL, disrupt the distribution of water in the system. Ironically, one of the reasons people and businesses put in an in-line booster is because of the unreliability of the GWCL system.

5.4.4 Low income households depend on expensive alternative service providers

The GWCL system is the source of water in GAMA. The GWCL system contributes to 98.6 percent of the total capacity of water supply systems in GAMA and to 99.2 percent of the amount of water produced. However, only part (about 50 percent) of the population has direct access to the GWCL water supply services. Because of the legal and financial barriers the poor face, it is mostly the wealthier strata of the population that is connected to the GWCL network, which enables them to profit from the considerably lower rates per unit of water than people who are not able to connect.

The majority of people in the Greater Accra Metropolitan Area, especially the poor, depend on alternative water service providers. As was shown above, there are a variety of service providers, all providing different services in different areas at different rates. Rates charged by these alternative water providers are higher than the GWCL tariff. This is (partly) due to the extra costs the alternative service providers have to make in order to provide the service. This includes the costs of the water, the transport (e.g. fuel, tanker truck) and labour to sell the water to customers. Prices and quality of water provided by the alternative service providers is not regulated, as alternative providers are not formally recognised, registered and regulated.

6 Storm water drainage and flood control

This chapter takes a closer look at storm water drainage and flood control in the Greater Accra Metropolitan Area. It gives a description of the main storm water drainage infrastructure (section 7.1). Furthermore, it gives an indication of the requirements for storm water drainage by giving an estimation of peak runoff in the different catchment areas in the Greater Accra Metropolitan Area (Section 7.2). The reality of flood occurrences is presented in section 7.3, as is the re-use of storm and wastewater in urban agriculture. This is followed by a description of the main current and future challenges related to storm water drainage (section 7.4) and a presentation of suggested strategic directions for addressing these challenges (section 7.5).

6.1 Storm water drainage infrastructure

There is no comprehensive storm drainage network in most of the urban areas in the country. In Accra, most of the drainage of storm water takes place though natural drains. None of the drains in the Densu (including Lafa) and Mokwe basin are lined and in the other basins only part of the drains are lined or otherwise improved. A more detailed overview of these drains and their current condition can be found in Annex 11. For the design of major drains, the maximum rainfall occurring once in 25 years is used.

Figure 26: Secondary drain in Accra (Dzorwulu Drain which leads to the Odaw River)

Even though recent road projects and other urban developments have made substantial investments in tertiary drains, little or no attention has been paid to primary and secondary drains. The institutional framework related to storm water drainage is weak, as presented in the box below.

Box 4: Institutional arrangements for storm water drainage

Even though the National Water Policy (MWRWH, 2007) is strong on water supply (rural and urban) and integrated water resources management, it does not give a clear direction for the management of storm water. Brief mention is made of the Hydrological Services Division as being part of the Water Resources Information Services (WRIS) institutions. In the National Water Policy, storm water management is only mentioned under Focal Area 10 which looks at extreme events such as flooding. Even then it mainly refers to emergency water supplies during extreme events to mitigate the effects.

The ministries with responsibilities for drainage are the Ministries of Water Resources, Works and Housing and the Ministry of Roads and Transport. Having the NESP give the policy direction on flooding and drainage also brings the Ministry of Local Government and Rural Development (and MMDAs) into the picture while the HSD remain a sector agency under the Ministry of Water Resources, Works and Housing. The responsibility for primary drains lies with the Hydrological Services Department of the Ministry of Water Resources Works and Housing. The responsibility for constructing secondary and tertiary drains lies with the Department of Urban Roads of the Ministry of Roads and Transport, as drains are usually installed as part of road construction. This activity falls under the Urban Roads Department (metro roads unit) which is under the Metro and Municipal Assemblies. They also have a secondary responsibility of maintaining the drains. Funds are available for those activities, which are commonly undertaken by contractors.

The Metropolitan and Municipal Assemblies within GAMA are responsible for maintaining (in this case mainly cleaning and de-silting) tertiary drains. Under the Urban Environmental Sanitation Project UESP II, assistance was given to AMA to take over the management of storm water drainage from the Hydrological Services Department of the MWRWH. Under this new arrangement, the AMA is expected to create a Drainage (Maintenance) Unit, which is expected to handle issues with storm water management in Accra (ASIP Appraisal Report, 2005). This Drainage Maintenance Unit, which should be under the Waste Management Department (WMD), is expected to be equipped to undertake this activity on a regular basis(personal communication shows that the DMU has been created but it is not well resourced to carry out the functions envisaged for it adequately).

6.2 Demand for storm water drainage

The peak storm water run-off in the basins in the Greater Accra Metropolitan Area can be calculated based on the size of the basins, the run-off coefficient, storage coefficient and the rainfall intensity. The run-off coefficient of urban areas ranges between 0.7 and 0.95. With increased urbanisation of the drainage basins, the run-off coefficient will go up, as will the peak run-off. The peak run-off as determined by Nyarko (2002) is presented in the table below.

Table 22: Peak run-off

	Area (km^2)	Peak run-off (m^3/s)
Densu catchment (downstream of Weija)	122	1432
Korle basin	291	2432
Kpeshie catchment	62.6	341
Mokwe-Songo catchment	31	218
Sakumo II Catchment:		3230

Source: Adapted from Nyarko (2002) (see annex 12 for details)

As mentioned in chapter 6, in addition to the storm water, the storm drains handle a large part of the (grey and to some degree black) wastewater. The amount of grey and black water transported through the storm drains is however difficult to determine.

With the introduction of more water in the city and with the increased proportion of the city that is paved, storm water run-off is likely to increase in the years to come. Possibly more erratic rainfall caused by climate change will only aggravate this.

6.3 Storm water drainage reality

Many areas in the Greater Accra Metropolitan Area are affected by the lack of proper storm water management, causing flooding and water logging, especially in the rainy season. On the other hand, storm water serves as a resource for the production of agricultural products in several areas in Accra, when urban agriculture is practiced. Both flooding and urban agriculture are described below.

6.3.1 Flood risks and flood occurrences

The Greater Accra Metropolitan Area faces serious flooding problems during the rainy season which causes damage to life and property. The situation is especially bad in the low-lying flood prone areas, where many the urban poor live in unplanned and often informal settlements. The figure below shows a map of flood risks as determined by Nyarko (2002)[15].

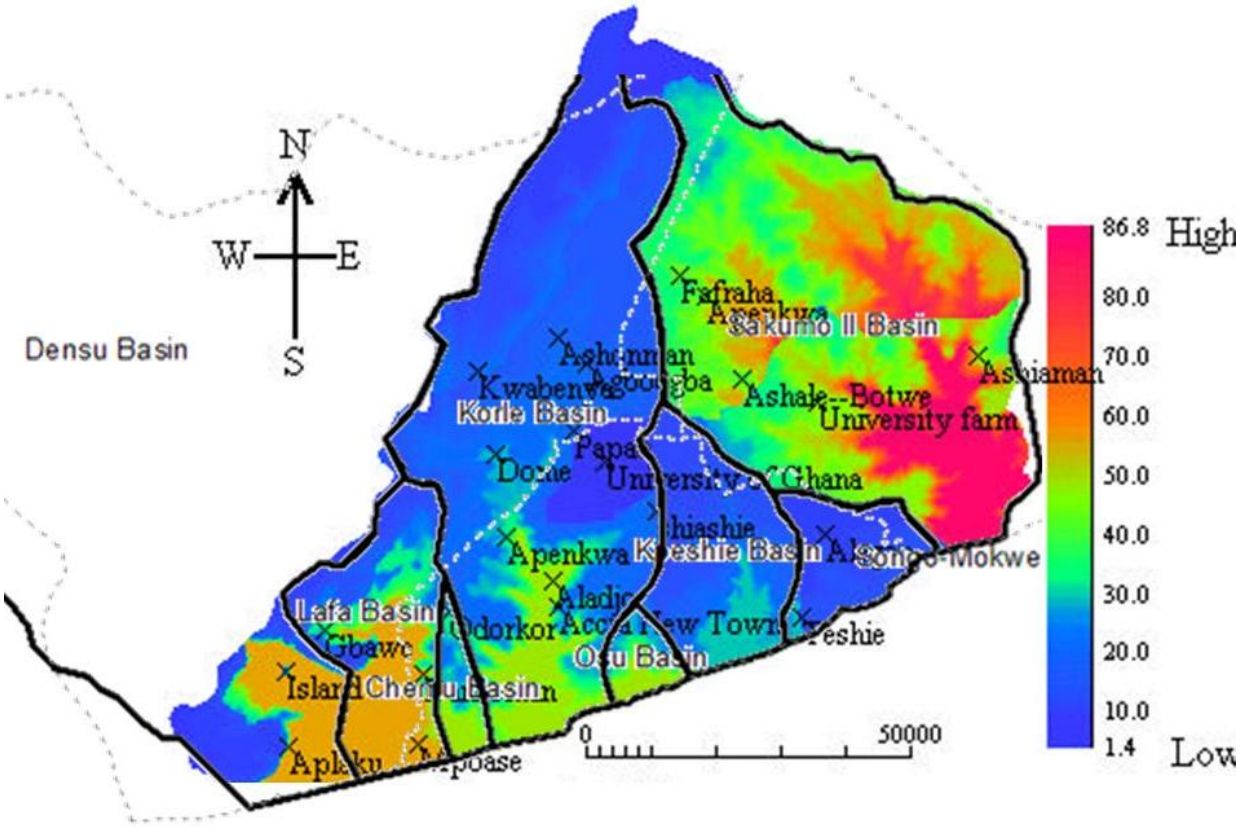


Figure 27: Flood risk areas
Source: Adapted from Nyarko (2002)

Flooding is common along the 8km of the Densu River below the Weija dam whenever there is overtopping or deliberate release of water over the spillway. Flooding is also prevalent in the Dansoman

[15] Twumasi and Asomani-Boateng (2002) present an almost identical map of flood risks in GAMA.

area and along the Lafa stream where it crosses the Winneba and motorway extension roads (AMA, 2006a). This is in line with the high flood risk as indicated in the map above (the orange/ brown areas in the Densu and Lafa Basin).

In low-lying areas of the Korle-Chemu Catchment, flooding is a serious problem with many houses being inundated by floodwater during and after heavy rains. In low lying areas near the Accra Academy School in Kaneshie, rapid run off from Asoredanho overflows into the Bank of Ghana flats, because the inlet to the Kaneshie drains is inadequately designed. Similar problems occur in the industrial land cemetery area around the Obetsebi Lamptey Circle where the interceptor drain and gullies are inadequate. There are many other areas like Nima, Dzorwulu, Darkuman and Alajo which have localised flooding problems caused by inadequate drainage channels and the flat nature of the terrain (AMA, 2006a). Most of these areas are indicated in the map above as the green areas in the Korle Basin.

In the Kpeshie Catchment, drainage in the La Township is inadequate and many waterlogged areas become flooded with light rains. In heavy rains, fence walls collapse and foundations are undermined. (AMA, 2006a). This area is indicated in the map as the light blue part in the Kpeshie basin.

Drainage channels in the western part of the Songo-Mokwe Catchment are not adequate, resulting in serious flooding in the Teshie-Nungua estates and the cutting of the main coastal road to Tema. The storm water channels constructed alongside and under this road are completely inadequate. Southern Teshie is subject to severe flooding in the rainy season. Large parts of Teshie are without proper drainage with only the lower channel sections leading to the sea outfall. Most channels are heavily silted and choked with refuse in the middle reaches. In central Nungua, the market cannot operate regularly because of waterlogged ground and poor drainage. The valley before the police barrier at Nungua also has inadequately sized culverts. Poor maintenance of the earth drains along the area of the Maritime Academy also causes flooding of the coastal road (AMA, 2006a).

As shown in the map in pink, areas especially prone to flooding are Tema and Ashaiman. People in these areas are often the victim of heavy flooding. On 20 June 2010, for example, 11 people lost their lives due to heavy floods in Ashaiman and Tema, which in addition left hundreds of people homeless, as reported by CitiFM, quoting the National Disaster Management Organisation (NADMO) (CitiFMonline, 2010).

6.3.2 The use of storm water drainage in urban agriculture

Part of the drained storm water is used for urban agriculture. Urban agriculture comprises a major part of the green area in the Greater Accra Metropolitan Area, producing a large part of the city's fresh food and vegetables, giving esthetical value to city and contributing to groundwater recharge and decreasing storm water run-off. Also, the importance of urban agriculture for income generation and food security should not be underestimated. According to Obuobie et al (2006), about 800-1,000 farmers earn an income from this activity.

Abraham et al. *(*2007) estimate that about 680 ha is cultivated with maize, 47 ha with vegetables and 251 ha with mixed cereal-vegetable systems. In addition, there are an estimated 80,000 tiny backyards covering a total area of about 50-70 ha. Plot sizes under cultivation in the city range from 0.01-0.02 ha per farmer and increase up to 2.0 ha in peri-urban areas. Practically any open space is used for farming vegetables and other crops because of the high demand from the city. Based on the mentioned irrigated

areas, the annual volume of wastewater that is used in Accra in urban and peri-urban agriculture is estimated to be 4.4 million m^3.

6.4 Current and future storm water challenges

The figure below gives a schematic overview of the storm water drainage and flood situation in the Greater Accra Metropolitan Area. It shows that the areas with limited infrastructure (unlined drains) and high run-off, like the Lafa and Sakumo II Basin, are very prone to flooding.

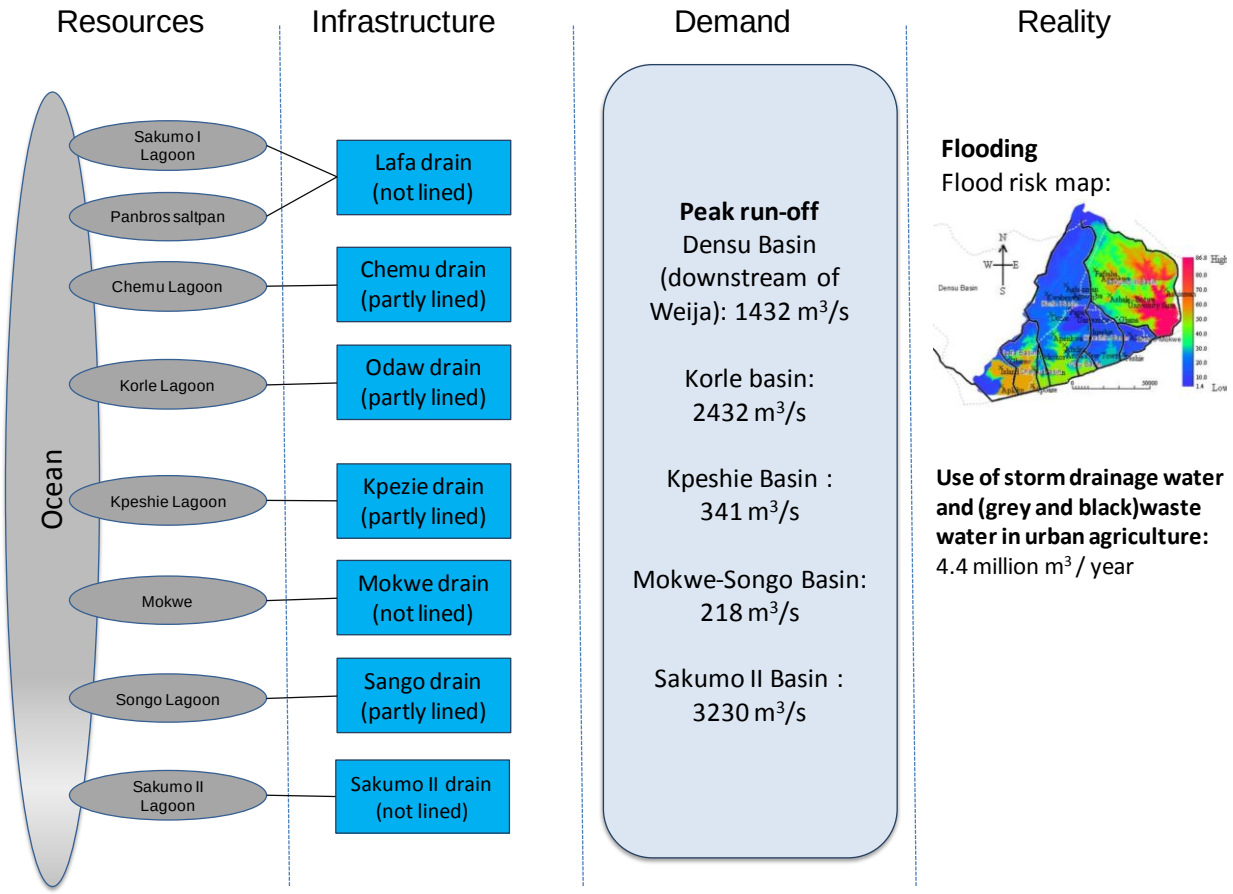


Figure 28: Overview of storm water drainage
Source: flood risk map, adapted from Nyarko,2002

Natural features such as geology, soil conditions and topography contribute to the occurrence of floods to some extent, but the majority of the flooding problems are created by the inadequate storm water drainage system, in combination with the growing urbanisation of the metropolis and the resultant impact of decreased infiltration and increased surface water run-off (AMA, 2006b). The sections below take a closer look at these challenges and their root causes.

6.4.1 Inadequate storm drainage system

The inadequate nature of the storm drainage system has a number of causes, which must be considered when developing strategic directions for improving storm water drainage. These include:

- Under-sizing of culverts and drainage channels

- The construction of structures in water ways
- Poor maintenance
- The blockage of storm drains by solid waste (see box below)
- The lack of coordination and lack of clarity on who has the mandate to maintain drains in the city. (for example, the challenge for AMA is funding to maintain the drains. However, the Department of Urban Roads has funds for which it puts out tenders for contractors to bid)
- Focus on ad-hoc solutions after flood occurrences rather than on long term solutions

Box 5: Solid waste generation and management

Per capita production of refuse is estimated at 0.40 kg/day (Fobil, 2001). Fobil (2001) estimated that 60 percent volume weight of this amount of waste generated is organic. The current solid waste production (based on 2007 population) can thus be estimated to be 1.4 to 1.6 million kg per day and might increase to anywhere between 3.0 and 6.5 million kg per day by 2030.

According to Anomanyo (2004), about 60 to 75 percent of the solid waste generated in the city is collected. The solid waste that remains uncollected often finds its way into open drains, blocking them and creating a breeding ground for mosquitoes and flies but also for foul smells (Fobil, 2007). The worst solid waste contributor is plastics like empty water sachets, due to its high presence, slow breakdown and impermeability.

Solid waste management in Accra has been characterized by single and ad hoc solutions such as: mobilising people to collect waste and de-silt choked gutters after a flood disaster or for an occasion; temporal allocation of waste collection contracts and damping or building a central solid waste composting plant (Anomanyo, 2004). The WMD of the AMA itself is unable to collect most of the waste and therefore engages the services of private operators to collect the waste generated. In recent times, there have been attempts by one of the private operators (Zoom Lion) to solve the problem of waste management through the introduction of the tricycle concept, which was aimed at clearing waste and at the same time reducing unemployment. Years on, even though there has been some level of improvement, solid waste management still remains a problem that the city grapples with. Another problem facing the collection of solid waste is the final disposal. At the moment, the existing landfill sites are full and the proposed new ones have not been operationalised due to local resistance.

Figure 29: Solid waste clogging a drain

6.4.2 Increasing surface run-off caused by decreasing permeability

The Greater Accra Metropolitan Area is developing and expanding, especially to the northern and western outskirts. This development can result in increasing 'sealing' of the soils in the upstream parts of the urban catchments. The loss of permeability can result in a large increase in storm water flows in the southern part of the city, which is likely to increase the flooding frequency and the subsequent damage to infrastructure, the economy and could endanger human lives. The future urbanised areas in the northern part of the city are likely to also result in a large increase in grey and black wastewater flows through the storm drains.

As large areas of the Greater Metropolitan Area become urbanised, urban farmers will find it more and more difficult to find land in the city to satisfy the city's demand for fresh vegetables.

6.5 Strategic directions for addressing storm water drainage

As presented in chapter 2, the Accra Learning Alliance formulated the following vision related to storm water drainage: "In 2030, Accra will be a cleaner city with a well-functioning drainage system. There will be integrated solid waste management (collection, transport, treatment and final disposal) of solid waste in a sustainable way. At least 90 percent of the solid waste will be collected. The improved collection of solid waste will have eradicated the dumping of solid waste into small and larger drains. The drains will be free from solid waste, and pollution of the surface waters and the risk of flooding will have reduced. There will be improved productive uses of water for livelihood (micro enterprises and agriculture), especially through the reuse of storm water and/or wastewater in urban agriculture."

Below, a number of strategic directions are discussed for achieving this vision. These include options for improving storm water discharge and options for reducing surface run-off.

6.5.1 Strategic directions for improving storm water discharge

Improving storm water drainage will reduce flooding and will contribute to a healthier and safer Accra.

In order to **improve the discharge of storm water in existing drains** and waterways, which are currently often blocked by solid waste and silt, the following interventions could be considered:

- Covering storm drains to prevent inflow of solid waste (this option was highly debated since LA members were of the view that it is highly expensive and may not have a high impact due to the poor attitude of citizens and the low maintenance culture of the society)
- Preventing the inflow of sand and gravel of roads into drains
- Improving solid waste management
- Improving maintenance of storm drains
- Enforcement of by-laws to prevent the construction of real estate in water courses

These interventions will require the involvement of different institutions and good coordination between the institutions involved. There is a high need to clarify and spell out who is responsible for what when it comes to storm water drainage. Clarifying roles and responsibilities and coordination between different institutions involved in water management in the Greater Accra Metropolitan area is discussed in more detail in the chapter eight.

Besides improving existing drains, there is a need to **expand the existing drainage system**, especially in the long term. Even though there is a proposed drainage master plan for the city, there are challenges with funding for the implementation of these plans (Personal communication, Mr Wise Ametefe (2008) and Ametefe, forthcoming). Extending the storm water drainage system is expensive. Concrete lined drainage channels on both sides of residential streets are often more expensive to construct than the road itself. There is the need to review the current design standards to ensure all drainage systems have adequate capacity but also that standards adopted are not excessively expensive (AMA, 2006b).

6.5.2 Strategic directions for reducing surface run-off

In order to prevent some of the potential problems raised above, it is proposed to carefully plan for the expansion of the city, such that the expanded urban water system is flexible and will be able to cope with the changed situation.

It is recommended that the city adopts a **water sensitive urban design (WSUD) approach** where future developments are done with an "interdisciplinary cooperation of water management, urban design and

landscape planning which considers all parts of the urban water cycle, combines water management functions and urban design approaches and facilitates synergies between ecological, economic, social and cultural sustainability" (Wagner, 2009). The objective of WSUD for storm water management includes:

- Protection of natural systems: that is to protect and enhance natural water systems within urban developments. This is recognised in the National Environmental Sanitation Policy, which states that regulations preventing the use of wetlands as disposal sites will be enforced. It goes on to state that awareness of the importance of wetlands and water courses will be increased through the support of advocacy on interventions aimed at restoring and improving wetlands.
- Integration of storm water treatment into the landscape: that is use storm water in the landscape by incorporating multiple use corridors that maximise the visual and recreational amenity of developments
- Protection of water quality: that is to protect the water quality draining from urban development
- Reduction in run-off and peak flows: that is to reduce peak flows from urban development by local detention measures and minimising impervious areas. This is lined to the availability of space to hold storm water
- Addition of value while minimising development costs: that is minimise the drainage infrastructure cost of development (Beecham, 2003)

A range of sustainable urban drainage measures could be adopted to reduce the run-off which leads to flooding. A green belt approach could be applied around the 2010-city and develop the new city to the north and north-west of the green belt. The green belt will accommodate a number of functions:

- It will provide space for storm water retention, storage and/or infiltration, thus reducing the storm water flows that pass through the 2010-city
- It will provide space for urban agriculture and for reuse of storm water, treated wastewater and/or composted sludge. For that purpose the wastewater and sludge will have to be treated in treatment plants located just north of the green belt
- It will provide the opportunity to develop high quality housing along the edges of the green belt
- It will provide opportunities for recreation

In order to realise this, there will be a need for good planning and strict enforcement which may be a big challenge for a city like Accra.

At the household level, rainwater harvesting (as discussed in chapter 5) and the reuse of grey water can reduce the run-off of grey and storm water. This can be stimulated by education and awareness raising campaigns on the use of rainwater harvesting and grey water reuse techniques and by providing incentives for installing these technologies at the household level.

7 Institutional Coordination and Planning

This chapter focuses on the cross-cutting institutional issues. It is to a large extent based on the institutional mapping done within the framework of the SWITCH Project (Darteh, forthcoming) and on discussions within the Accra Leaning Alliance. Section 8.1 presents an overview of the institutional set-up of urban water management in Ghana and the Greater Accra Metropolitan Area in particular. This is followed by an analysis of the main challenges in section 8.2 and the presentation of suggested strategic directions to address the challenges in section 8.3.

7.1 Overview of institutional setup for urban water management

There are various institutions, both at the national and local levels, that have authority over the different aspects of urban water management. Institutions in this case refer to organisations, legislations and regulations, national policy framework and by-laws of the Metropolitan Assembly in Accra. The table below gives an overview of these institutions. The table demonstrates the clear separation of functions, which was part of the sector reforms begun in the 1990s. This sometimes serves as a barrier to integration.

Table 23: Overview of institutional arrangements in urban water management in GAMA

	Water resources and supply	Excreta and wastewater management	Storm water drainage
Policies	Upcoming National Urban Policy		
	National Water Policy	National Environmental Sanitation Policy	
Policy making, planning and financing	NDPC MoFEP		
	MWRWH	MLGRD MRT	MLGRD MWRWH
Legislation	Parliament MMDAs		
Bye-laws		e.g. MMDA bye-laws, requiring each household to have a latrine	
Regulation	WRC PURC	EPA	
Service Provision	GWCL/AVRL Private service providers Water and sanitation development boards (community management service providers, facilitated by CWSA)	WMD-AMA Public latrine operators	Hydrological Services Department, Department of Urban Roads MMDA (drainage maintenance unit)
Consumers and civil society groups	Citizens of the Greater Accra Metropolitan Area, NGOs		

Source: Darteh, forthcoming

As service provision and regulation have been discussed for the various elements of the urban water cycle in the previous chapters, the emphasis will here be on law and formal regulations and ministries and key government agencies.

7.1.1 Law and formal regulations

Parliament (constitution of Ghana, 1992)
The functions of parliament are guided by the 1992 constitution of Ghana. This is the supreme law of the country and it promotes the rights of all citizens including access to water. This is found in Article 35 (3) which enjoins the state to promote just and reasonable access by all citizens to public facilities and services (including water). Within parliament, there are the Parliamentary Select Committees; the relevant ones in this case are the Select Committees on Water Resources and Local Government.

All formal agencies also act within an overall sector policy. A cursory glance at the institutional set up shows strength at the level of policy. For example the existence of a National Water Policy that gives an overall direction for the water resources and water supply (rural and urban) subsectors. The National Sanitation Policy which has recently been approved by Parliament gives an overall direction for the wastewater and storm water subsectors.

7.1.2 Ministries and key government agencies

The **Ministry of Water Resources, Works and Housing (MWRWH)** used to be known as Ministry of Works and Housing; significant even is the addition of water to the name of the ministry to show the recognised importance of its functions for water supply. A water directorate was created in 2004.

The MWRWH is responsible for setting the water policies for the country – resource management and supply of drinking water (both urban and rural). The policy objectives are achieved through its agencies - WRC, CWSA and GWCL. Regulatory functions in respect of the supply of drinking water and consumer protection are the responsibility of the PURC (for urban water) and District Assemblies (for community-managed water systems).

The **Ministry of Local Government and Rural Development (MLGRD)** is responsible for the policies and programmes for the efficient administration of local government structures. With the current emphasis on decentralisation, most of these policies are carried out through Metropolitan, Municipal and District Assemblies (MMDAs). These are responsible for environmental sanitation – both water-borne and solid waste. They mobilise and negotiate for international funding for capital projects in the sanitation sector. This has in some cases involved water projects as part of urban renewal programmes which have a poverty reduction focus.

Water and sanitation are cross-cutting and health outcomes can be achieved through a holistic approach to both water and sanitation. Hence there is need for MWRWH and MLGRD to harmonise policies and programmes.

Ministry of Finance and Economic Planning (MOFEP) provides the finance to support the delivery of urban water and wastewater infrastructure as well as the operational and capital expenditure budgets of the sector institutions. Most development assistance from donors is channelled through the ministry. The sector relies substantially on donor funds (agreements are between donors and the ministry acting on behalf on the government).

The **National Development Planning Commission** (NDPC, Act 479, 1994) is the main body responsible for broad policy formulation on which basis Ministries, Departments and Agencies formulate their sectoral policies. The NDPC may at the request of the President or parliament, or on its own initiative, study and make strategic analyses of macro-economic and structural reform options and make proposals for ensuring the even development of the districts of Ghana by effective utilisation of available resources. It also monitors, evaluates and coordinates development policies, programmes and projects. The NDPC organises orientation regarding national policies and programmes for MMDAs as and when needed. One of the major tasks for the NDPC in recent times has been to co-ordinate the preparation of the Medium Term Development Plans for the MMDAs. The NDPC is currently in the process of developing an urban policy and this provides an avenue for including issues of Integrated Urban Water Management as a strategic direction for urban authorities.

In line with Ghana's decentralisation programme, Local Government Authorities (LGAs) – **Metropolitan, Municipal, and District Assemblies** - have been given clear-cut quasi-legislative, and administrative powers enshrined in the Local Government Act, 462(1993). DAs may as appropriate delegate any of its functions to Town, Area, Zonal or Urban Council or Unit Committee or such other body or person it may determine. Within Accra, or what is referred to as GAMA, the relevant local authorities are the Accra Metropolitan Assembly, Ledzekuku-Krowor Municipal Assembly, Tema Metropolitan Assembly, Ga East Municipal Assembly, Ga West Municipal Assembly, GSMA, Adenta Municipal Assembly and the Ashaiman Municipal Assembly.

Even though Ghana has been practising decentralisation for more than a decade and the Local Government Act 462 (1992) also prescribes that district assemblies should provide social amenities to their inhabitants, the water sector is not fully decentralised to the district level, thus the city of Accra does not plan for its water supply. However, the concept of community management of water supply in rural and small towns places considerable responsibility on the MMDAs in ensuring that water facilities are well-managed in a sustainable manner.

Even though Integrated Urban Water Management is not explicitly mentioned in the National Water Policy, the guiding principle for water resources management is that of Integrated Water Resources Management (IWRM). This is captured in the NWP (MWRWH, 2007) as follows:

"It is important to adopt a holistic approach to water resources management and development."

7.2 Challenges

A study conducted by the UN-Habitat in 2009, showed that the AMA administration structure is weak and is confronted with the following: "*Dual allegiance of decentralised departments, incomplete decentralisation, non-connectivity of departments, lack of transparency, over centralisation of administration and financial issues. There is also the problem of functional duplication of public and parastatal agencies in performing their statutory obligation in the same geographical location of the city authority; these most often create friction and duplication"* (UN-Habitat, 2009). Here we will have a closer look at a number of these challenges and their root causes.

7.2.1 Incomplete decentralisation

While the Local Government Act, 1993 (Act 462) and Local Government Service Act, 2003 (Act 656) seek to effectively transfer the functions and offices of central ministries, departments and agencies to the Assemblies, this has not happened and many still exist and function as central government dependencies (MLGRD, 2010). An example is the Ghana Water Company Limited and the role it plays in the AMA with regards to water supply. These problems listed above are not peculiar to AMA but also common to the other District Assemblies that make up GAMA. The Local Government (Departments of District Assemblies) (Commencement) Instrument LI 1961 was passed in 2009 also to ensure that in line with the 1992 constitution [article 240 (2) (d)], persons in the service of local government shall be subject to the effective control of local authorities for purposes of accountability and good governance.

7.2.2 Inadequate planning and coordination

The action of the various institutions responsible for the different aspects of IUWM are not well coordinated, and in many cases planners and operators are hampered by limited sharing/access to accurate data on key aspects to inform their planning, decision making and monitoring of progress towards objectives.

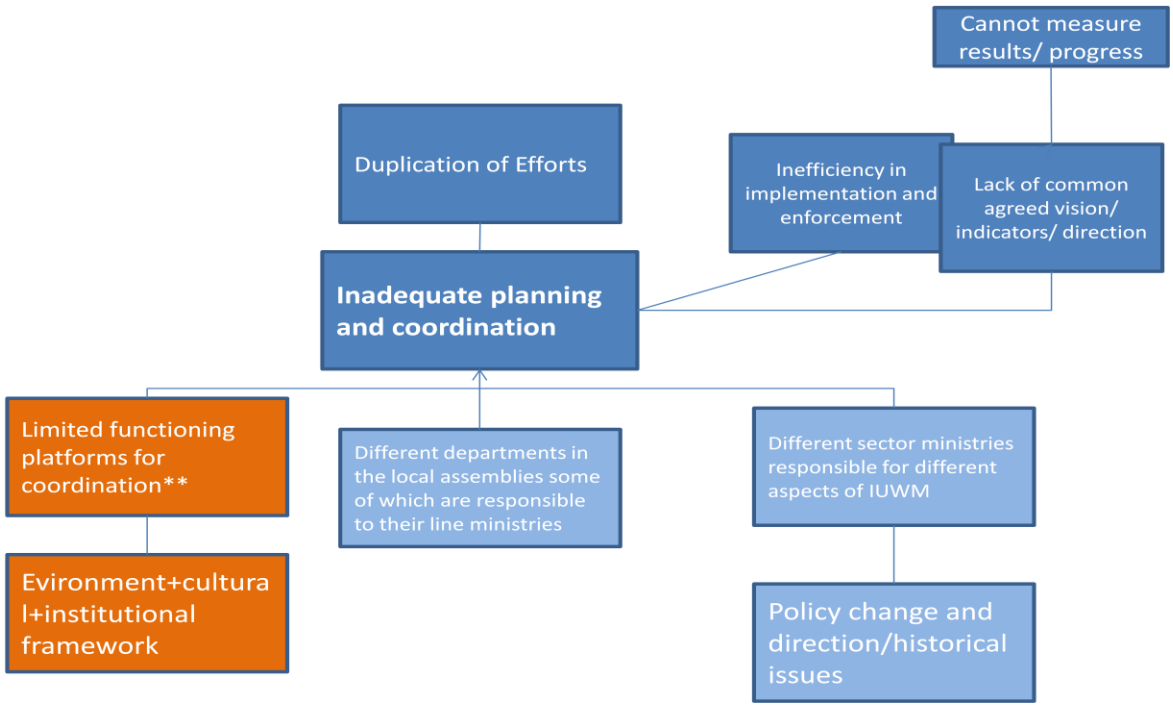


Figure 30: Causes and consequences of inadequate planning and coordination

One of the root causes of inadequate planning and coordination is the fact that different sector ministries are responsible for different aspects of integrated urban water management. There are various plans and planning processes related to various aspects of water management and sanitation within Accra (e.g. the Medium Term Development Plans of the MMDAs, and the Strategic Investment Programme of GWCL). However, responsibilities for different aspects of water management and

planning are fragmented and the enforcement of existing plans is weak. Currently there is no master plan or overarching strategy for delivering water, sanitation and drainage.

Because all these agencies are directly responsible to their line ministries and each of them works with their own 'rules and regulation' they are often found 'doing their own thing'. As a result, even though opportunities exist for investment in the sector through government/ESA/DPs, there is the threat that inadequate planning and coordination among sector agencies will prevent these from being achieved. Interviews of stakeholders in the sector show that stakeholders perceive that there is a minimal level of coordination in the sector. This is also a common topic of discussion. A communiqué released at the end of the 4th Accra LA (which was combined with the 2nd National Level Learning Alliance Platform meeting) indicated the lack of coordination is a contributing factor to the low delivery of improved services for water and sanitation (SWITCH /RCN, 2009).

Some of the issues relating to urban water management in Accra stem from other municipalities and regions. For example, water supply to the city depends to a large extent on sources from outside the city and indeed the region. This means that pollution of water sources or even problems with the pipelines in the areas through which they pass before getting to Accra, cuts across municipalities and district assemblies. As can be seen from chapter two, 'Accra' has gone beyond the AMA boundary and now involves municipalities that surround the city. This has an effect on water supply, sanitation and storm water management. The rapid development of communities on the fringes of Accra (in areas along the main water supply distribution lines) has reduced how much water is available to residents thereby having an adverse effect on water supply in the city. It has also affected the volumes of storm water that the city has to deal with. Septic waste volumes in the city have also been increased since septic waste from these areas are brought to 'Lavender Hill' to be dumped.

This rapid growth of the city, especially around its fringes, poses a challenge to the already fragmented institutional set up and affects planning and coordination within the city. This is because more than one planning authority comes into play when looking at a broader Greater Accra Metropolitan Area (GAMA).

As mentioned above, the Ministry of Water Resources through its sector agencies have responsibility for water supply and resource management while the Ministry of Local Government through the metropolitan, municipal and district assemblies have responsibility for wastewater management. To make matters worse, within the metropolitan and municipal assemblies, different departments are also responsible for different aspects. For example, within the Accra Metropolitan Assembly there is a now a separate waste management department and sewerage department (previously, the sewage unit was under the waste management department). There is also the Urban Environmental Sanitation Project which is investing in new sanitation facilities and programmes. More often than not there is very little room for coordination even among the different units under the same department. Some of the departments are responsible to their line ministries and sometimes receive funding from their line ministries even though they are under the assemblies. The planning and coordination units of the assemblies are supposed to coordinate activities at the assembly level, but because of the challenges of information flow among these departments, each department seems to be locked up in its own 'silo'.

The result is that there is duplication of activities and interventions. For example, the Hydrological Services Department has in its mandate to develop a drainage master plan for which funding has been a challenge but the Urban Roads Department under Ministry of Road Transport has funds to construct drains as part of their work. They also have funds to maintain the tertiary and secondary drains, but the drainage unit of the Waste Management Department, which is also responsible for cleaning/maintaining

drains, remains challenged in doing their work. This makes it difficult to also measure the results and progress towards a set target. Another result of the lack of planning and coordination are inefficiencies in the system, some of which are due to the fact that each department sets its own targets and definitions and works towards them.

7.2.3 Functional duplication

The above compounds the already existing situation where there is functional duplication of public and parastatal agencies in performing their statutory obligation in the same geographical location of the city authority. As mentioned earlier, a classic example is in the area of water supply. Local Government Act, Act 462 gives one of the functions of district assemblies as providing for amenities including water services. In practice the delivery of water services has to a larger extent been delegated to GWCL with municipalities playing a minor role. This brings about more than one planning authority for water supply - the GWCL planning unit and the metropolitan or municipal planning (in this case different municipalities are autonomous). The Ghana Water Company is not decentralised to the municipality level and their regional/ district offices are not accountable to the assembly but rather to the main GWCL Headquarters which is under the Ministry of Water Resources. The challenge of having more than one planning authority is with getting them all to work together. Compounding this situation is the fact that the utility (GWCL/AVRL) operates with one set of boundaries and municipalities have different boundaries, as was presented in Box 2.

Individuals get permits to build houses in new areas without much regard to whether that is within the planning horizon of the service provider (i.e. GWCL) or not. They go ahead and build and later request water services. Once these people are not connected to the formal utility they are not considered to be customers. This brings to the fore another issue of institutional accountability for provision of water services and sanitation. There is lack of clarity on who is responsible for the extension of water and sanitation services to the people who are currently unserved (especially the urban poor). There is a lack of central oversight and there are no plans to systematically deal with the un-served especially the urban poor and those living in peri-urban areas. It would seem in principle though that it is the responsibility of the municipality (based on Act 462) even though it doesn't have a clearly defined mandate for water supply. People not connected to the networked water and sanitation services, rely to a large extent on informal service providers. Regulation of these informal service providers is weak to non-existent due to the fact that they are not formally recognised and thus it is difficult to regulate them.

7.2.4 Challenges with long term strategic planning

Beyond coordination, long term strategic planning is a challenge. This is the result of inadequate reflexive analysis. This is a vicious cycle because it goes back and forth between the problem and effects. When problems emerge, social and political pressures coupled with the lack of capacity for dealing with problems in a strategic way prevents a proper analysis of the problem. A study of the Strategic Investment Plans (SIPs) of some sector agencies show more emphasis on the expansion and provision of new/more facilities without much consideration for management of existing facilities. Aspects such as operation and maintenance (O& M) appear to have low emphasis. The result of inadequate problem analysis is that proper plans are not put in place to adequately deal with problems leading to ad-hoc

measures which are not sustainable. Inadequate implementation of plans is also due to the inadequacy of implementation capacity and inadequate enforcement.

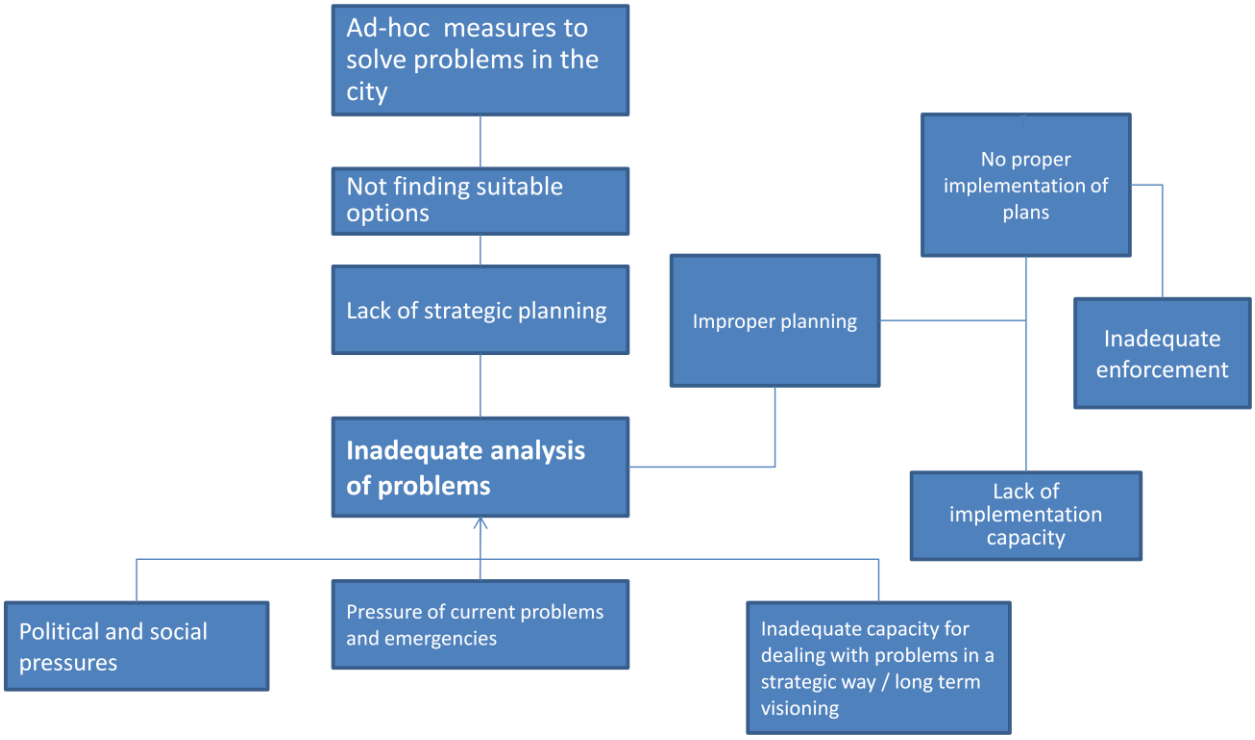


Figure 31: Causes and consequences of inadequate analysis of problems

8 Conclusions

Accra lies at the bottom of one of the region's major rivers. It is blessed with abundant access to water resources. There does not seem to be a short or medium term threat to these, unless major unprecedented climate change or changes in upstream abstraction intervenes.

The main threat to water supply for the Greater Accra Metropolitan Area is not availability of water resources but mismanagement of the water supply system. The system has been shamefully mismanaged over the last decades to the extent that it is now at the point of collapse. Levels of non-revenue water are high, and there are constant supply interruptions.
While the treatment capacity is currently almost sufficient for supplying today's population, this will undoubtedly have to be expanded to deal with inevitable growth in population. It is crucial that this happens in a planned manner. In addition, steps will have to be taken to decrease the amount of non-revenue water.

Barriers to access to water supply services need to be sorted out and appropriate service delivery models need to be identified for high density and unplanned urban areas that are not suited to household connections. Promising approaches include:

- Community managed distribution of utility bulk supplies
- Registration and regulation of alternative providers

It should be noted that bringing the water supply up to scratch – i.e. a tap in every house – has to go hand-in-hand – and cannot run ahead of – bringing the housing stock up to scratch (i.e. a tap in every house does not equal a tap in every shack)

Accra's excreta and wastewater management is arguably even more shamefully mismanaged than its water supply. The system is to all intents and purposes non functional. There is an urgent need to identify realistic options to provide dignified and affordable access to sanitation facilities, and there is an urgent need to identify appropriate means to collect, transport and treat urban liquid waste. In addition, long term solution(s) to liquid waste need to be identified urgently. This will likely mean a service ladder approach with different service levels in different areas. As with water, sanitation improvement cannot run (far) ahead of housing stock improvement. Promising approaches include:

- Privately managed public latrines, especially as a short and medium term solution
- Rehabilitation of sludge treatment and disposal facilities

Many areas of Accra are prone to flooding**.** Floods are exacerbated by the increase of paved areas without a concomitant increase in drainage capacity, building in waterways and by blockage of existing drainage capacity due to poor solid waste management. Urban flood reduction requires the development of more sustainable drainage systems and better solid waste management. In addition, there is a need to identify options for reducing surface run-off.

Institutionally, the sector is fragmented with overlapping and contradictory areas of responsibility. There is poor-to-no enforcement of existing (planning) regulations and a lack of frameworks for integrated planning. In order to improve this situation, the following is suggested:

- Clear delineation of boundaries and responsibilities
- Creation of integrated planning frameworks and coordination structures

- Enforcement of existing laws and by-laws

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Optimizing social inclusion in integrated urban water management in Mamobi and Teshie, Ghana

A comparative analysis on social inclusion in drinking water supply, safe sanitation services and protection from floods

Dr Francess Dufie Azumah, Dept. of Sociology and Social Work, KNUST, Ghana

6/3/2010

Reviewed by Ingeborg Krukkert and Joep Verhagen (IRC) and Dr. Kwabena Nyarko (KNUST)

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Gender and survival strategies in perennial flooding. **Error! Bookmark not defined.**

Executive Summary

This paper describes various dimensions of social inclusion in Mamobi and Teshie, two low income areas in Accra, Ghana. The study is carried out under the SWITCH programme: Sustainable Water Management Improves Tomorrow's Cities Health, a five year action research programme, co-funded by the European Commission[16]. The programme is implemented by a cross-disciplinary team of 33 partners and 13 cities in 15 countries around the world. The inclusion of formally excluded groups is the focus of the Social Inclusion Work Package of SWITCH.

The specific objective of this paper is to compare the data on social inclusion which are published as two separate case studies: one on Teshie, and one on Mamobi.

Social exclusion

The study examined social exclusion at a city level in relation to three specific focus areas: drinking water, sanitation, and floods in Teshie and Mamobi. The determinants of social exclusion considered variables in relation to the issues of 'who they are' (ethnicity, gender, age and social class/statues); where they are/live (this captures access to/distance to basic services); what they have (monetary and non-monetary assets); and what they know (access to information) had been explored through a qualitative descriptive case study. The tools for collecting information had been mainly in-depth interviews, focus group discussion and observation.

Profile of Teshie and Mamobi

Teshie is situated on the coast of the South-western corridor of Accra and has an estimated population of about 40 000. It is about 18 km away from the city centre and inhabited by the indigenous Ga people of Accra. Teshie is dominantly a fishing community. The area is poorly planned and crowded, and has insufficient drains. The people can be classified generally to be economically poor as the majority of men and women basically relied on fishing with a few into petty trading and food selling. Over 65% of the population is unemployed due to their direct and indirect association with the collapsing fishing industry.

The residents of Mamobi, especially those from Mamobi-East, are predominantly migrants from Northern Ghana and parts of West Africa- Mali, Chad, and Niger. Social exclusion is evident in Mamobi. The migrant community is made up predominantly by traders whose economic status are worse off in terms of access to social amenities such as portable water and disposal of solid waste. Mamobi residents, especially from Mamobi-East, have a low socio-economic status, characterized by a high rate of unemployment. High population density leads to overcrowding with undefined layouts of houses that characterizes a slum settlement. All of these are clear indicators of poverty.

Access to basic services

The majority of the people did not have access to basic services such as toilets or drinking water supply. Water is very scarce and residents have to pay exorbitant price for water which they purchase from private vendors who have a monopoly over the distribution. With the toilet facilities, it is clear that majority of the houses do not have toilets and residents have to resort to public toilets.

[16] SWITCH Managing Water for the City of the Future, http://www.switchurbanwater.eu/

These toilet facilities are insufficient or too far. In Mamobi residents have to walk between 5 to 10 minutes to get there. In addition, the public facilities are often closed during the night. Residents had to join long queues to access such facilities during the peak hours of 4.30 to 5.00am when they were usually opened.

Looking at waste disposal it became clear – at least in Teshie- that all waste is dumped in the sea eventually, no matter if there is a sewage or drainage system in place –which was very rare- or not.

Costs

The main barrier mentioned for access to basic services is costs. For all basic services costs appeared to be high: for drinking water supply residents are dependent on private vendors who can charge what they want. It is clear that residents are exploited unduly by private water vendors. In terms of household income, families spent between GH¢2.50- ¢4 (EUR 1.25 – 2.00) on water daily.

For public toilets people have to pay unless they are under 8 years old or above 65, regardless of the fact that there are too few facilities and that these are not well maintained. Finally, for disposing of solid waste residents also need to pay, although containers are not lifted regularly.

Flooding

Flooding is one of the frequent and common natural disasters that Ghanaians have been battling with for a very long time. Sadly, some Ghanaians continue to live and build houses in flood prone area and as a consequence left at the mercy of floods any time there is torrential rainfall.

Most respondents attributed the causes of flooding to inadequate drainage systems and dumping of refuse/garbage in the few constructed drains. This accounted for the perennial flooding the people have been experiencing and its attendant problem. Heavy rainfall and the rise of the sea level was also mentioned but was less highlighted than man-made causes.

Areas suffering from flooding are Mamobi East around the storm drain that had been constructed. In Teshie, especially Southern Teshie is subject to severe flooding in the rainy season. This is the area the drainage system runs through.

Respondents recounted that living under such conditions were really very difficult and demanding since they do not even get any assistance from any source when such phenomenon occurs. Perennial flooding has resulted in the impoverishment of the reseidents, as each time they have to start over again with the little income that they have managed to lay aside to replace their destroyed property.

It can be concluded based on the information obtained that the residents received little or no assistance in the form of relief or adequate protection from the state which is a clear sign of social exclusion.

Access to information

Pertaining to what the people know with respect to access to information on the available essential services and legal instrument that could be explored to their advantage, it was realised that the respondents both in Teshie and Mamobi were blatantly oblivious of the avenues to channel their grievances and to seek assistance with regards to water services and other necessities.

Conclusion and recommendations

Social exclusion is evident in both Old Teshie and Mamobi, especially East Mamobi with regards to access to basic social amenities which are needed for sustenance and are core indicators of development. There is a need to include the vulnerable and less privileged urban

poor especially women and children in the development agenda concerning urban water and sanitation given the differential impact of social exclusion on their daily lives.
The findings call for the need of participatory planning, implementation and monitoring of basic social amenities, together with community members and with a clear focus on the different gender roles, responsibilities and needs, the high population density and the economic status of community members. Access to drinking water and sanitation facilities should increase, as well as security at these locations, for example by improving the overall lighting system at the site and by establishing a community watch-dog to man these places to ensure the safety of users of the facility, especially women, children and the elderly, during the night. In order to prevent flooding the gutters need to be adapted to the present situation.

9 Social inclusion in the SWITCH programme

Current global change pressures, escalating costs and other risks inherent in conventional urban water management are making it increasingly difficult to efficiently manage scarce water resources. Also, satisfying water demand and waste water disposal without creating environmental, social or economic damage is a growing challenge.
The SWITCH programme aims to bring about a change in urban water management away from existing ad hoc solutions and towards a more coherent and integrated approach. It is the vision of the programme to create a 'City of the Future for All' which requires that normally excluded groups are brought back into the urban mainstream.
The inclusion of formally excluded groups is the focus of the Social Inclusion Work Package of SWITCH.

9.1.1 What is social inclusion and why is it important?

Social inclusion captures both individual well-being and the broader benefits of social cohesion and relates to many different domains of potential deprivation.
It also refers to the actions and processes needed to transform the situation of those who are socially excluded, by influencing institutions and changing the perceptions that create and sustain exclusion (Beall, 2002).
According to DFID, 'social exclusion is a process by which certain groups are systematically disadvantaged because of […] their ethnicity, race, religion, sexual orientation, caste, descent, gender, age, disability, HIV status, migrant status or where they live. Discrimination occurs in public institutions, such as the legal system or education and health services, as well as social institutions like the household' (DFID, 2005:3).
Social exclusion exists to some degree in all societies, and can occur across a number of dimensions: economic, social, political and cultural. These different forms of disadvantage form a self-reinforcing cycle. The concept of social exclusion covers a remarkably wide range of social and economic problems. Exclusion can be official or unofficial and can take place in a number of arenas, from the legal, health and education systems to the household and community. The processes of exclusion can be highly visible and deliberate, but can also be hidden and unintentional.

9.1.2 Four dimensions of social inclusion

This study captures four dimensions of social exclusion:

1. in terms of what people have or do not have in terms of access to resources (a lack of resources can be termed economic deprivation);

2. where they live (spatial deprivation occurs when stigma or a bad reputation of a specific neighbourhood acts as a barrier to creating social contacts or finding a job etc);

3. or simply because of who they are (discrimination flowing from specific group identities as perceived by others in society).

4. As a fourth dimension, access to information has been added (exclusion due to poor access to information, laws and policies).

In this study, these dimensions are applied to integrated urban water management.

10 Objectives and methodology

10.1 Objective of the study

The over arching objective of this study is to inform SWITCH and other Integrated Urban Water Management (IUWM) related projects on how to design and implement project and programmes in a socially inclusive manner.
The specific objective of this study is to compare social exclusion at city level in relation to integrated urban water management in Mamobi and Teshie, in Accra, Ghana. Specific focus areas are: drinking water, sanitation, and floods.
Specific objective: to compare social exclusion in Mamobi and Teshie looking at:

- mechanisms that exclude groups from adequate drinking water supply services;
- mechanisms that exclude groups from adequate sanitation services;
- mechanisms that exclude groups from adequate protection for urban floods;

Specific research questions that will provide a better understanding of the mechanisms that exclude certain groups:

- Who are the residents? This question captures exclusion on the basis of gender, age, social status, ethnicity, religion;
- Where are the residents located? This question captures exclusion on the basis of distance to basic services, existing stigmas that come with living in a specific place;
- What do the residents have? This question captures exclusion on the basis of monetary and non-monetary assets;
- What do the residents know? This question captures exclusion due to poor access to information, laws and policies that protects human right issues.

10.2 Research methods and tools

The specific research questions are investigated by answering the four key questions identified in the previous section: who you are, where you live, what do you have, and what do you know? The data were collected through three types of tools:

- In-depth interviews with residents (respondents) to provide rich insight to the issues under investigation;
- Focus group discussion in two different locations and social mappings;
- In-depth interviews with key-informants such as community leaders and local politicians.

Respondents were selected through a non-probability sample design using purposive, convenience and snowballing sampling technique. The reason why these techniques were adopted was due to the nature and characteristics of the population.
The total number of respondents that were involved in the study was forty six (46). Twenty four (24) from Mamobi, comprising of eleven males (11) and thirteen females (13) and twenty two

(22) from Teshie of which twelve males (12) and ten females (10). In addition, a total of 26 key informants (14 from Teshie and 12 from Mamboi) were also interviewed. Also, five different focus group discussions were conducted on each location.
The number of respondents who participated in the various categories of the interview can be found in the list of tables in Appendix A.

11 The Study Areas -Teshie and Mamobi

Teshie is situated on the coast of the South-western corridor of Accra and has an estimated population of about 40 000. Administratively Teshie is one of the two zonal councils (Teshie and Nungua) that make up the Ledzokoku Krowor Municipal Assembly (LEKMA) that was established on 1st November, 2007 and inaugurated on 29th February 2008 under the Legislative Instrument (LI 1815) under the Local Government Act. Teshie is about 18 km away from the city centre and inhabited by the indigenous Ga people of Accra.

The Teshie area is poorly planned and crowded, and has insufficient drains. The people can be classified generally to be economically poor as the majority of men and women basically relied on fishing with a few into petty trading and artisan occupation (see fig. 2.4.1 in the appendix). Over 65% of the population is unemployed due to their direct and indirect association with the collapsing fishing industry.

Mamobi, also pronounced '*Maamobi*', is under the Ayawaso Constituency and is divided into two areas: Mamobi East and Mamobi West. Both Mamobi East and West are divided by the Mamobi-Nima High Way. The community falls traditionally under Osu Traditional Council with its chief. Mamobi is a densely populated community in Accra with an estimated total population of 49,812 (GSS, 2002) and 2,077 housing structures. It is made up of different ethnic groups from Ghana and neighbouring West African countries (See further details on the study areas in appendix C).
Providing a description of Mamobi East, participants in all focus group discussions described Mamobi East as a deprived area considering their own indicators of population, education, employment and access to social facilities (toilet, schools, and refuse containers).
Mamobi West could be generally be described as middle class there were pockets of areas such as market, Adanseman and Iran clinic areas where poverty was about between 70-80% compared to the Explo and Club 10 areas where poverty was described as less than 30%.

12 Study Findings

12.1 Dimensions of social exclusion

In this section, the variables of social exclusion are examined which include "who you are"', "where you live", "what you have", and "what you know". Each variable is examined in detail in this section.

12.1.1 Who are the residents?

Ethnic and religious background

Ethnicity is one of the variables in relation to issues concerning identity –based social exclusion as it plays a crucial role regarding cultural discrimination and the marginalization of groups associated with stereotyping, prejudice charactering their cultural beliefs, norms and practices.
Likewise, gender is an important factor influencing discrimination and access to resources (CAP-NET, GWA 2006), but other factors, such as ethnicity, religion, may be relatively more important in some situations. Gender discrimination often articulates with these other forms of discrimination.

Teshie

The dominant ethnic group in Teshie is the Ga-Adangbe. Other tribes form less than 10% of all residents, comprising of Akan, Adanbges, Ewes and Dagombas. Of these groups the Akan's form the majority. The Ga's traditionally practice the patrilineal system of kinship; where an individual belongs to his father's decent group. This kinship system influences the transmission of property and the status of the individual. Ga women have the right to inherit the estate of their father, acquire family land based on the consent of family/clan heads who are predominantly male. However, if a woman is either a widow or divorced she has no right to or share in the husband personal estate.

Mamobi

Mamobi consists predominantly of people of northern descent (mixed culture). This includes people with different ethnic persuasions who are predominantly migrants and immigrants from northern Ghana and neighbouring West African countries such as Mali and Chad. Background history indicates that these people were descendants of ex-service military men officially settled there after the 2nd World War during the Gold Coast, with their families. It is this population that has grown overtime with their descendants having emanated into the current composition of whom the majority have been born in Accra rather than their native homeland (See table 4.10a, table 4.10b and table 4.9 in appendix A for further details).
Mamobi is predominantly of the Islamic faith and the distribution of property or estate of the deceased for the widow is based on the Koran, Suna chapter 4 which specify what is to be given to widows. Also, immigrants from neighbouring West African countries (Mali, Chad) were found in Mamobi unlike Teshie (See appendix C for further details on gender and ethnicity).

Age and marital status

The majority of the respondents were fifty (50) years and above with more men in this age bracket than women. See table 4.1 in appendix A for the age distribution of the respondents.

The results on marital status from both studies generally show that there were more married men and women than singles, with more men than women in this category (see table 4.3 in appendix A). However, there were some variations by locality. The data showed more married men in Teshie than Mamobi and less single men and women than Mamobi (see tables 4.4a&b in appendix A). Also, more women were found to be divorced or separated than men. This trend was more prominent in Teshie than Mamobi (see table 4.4a and b in appendix A).

Occupational status

The results obtained from the two studies reveal that the principal occupations of the respondents were dress making, petty trading and fishing which are traditional occupations of the residents that have been handed from generation to generation through the process of socialization. In terms of gender distribution, it was observed that most of the men were engaged in the fishing industry and artisanship while most of the women were in the trading industry and dressing making (See table 4.7 in appendix A for the occupation of the respondents based on gender from the two studies).

Teshie
In Teshie the predominant economic activity of the residents is fishing, both for men and women with a few practicing petty trading and food selling. (See table 4.8b in appendix A for the occupations of the respondents in Teshie). Over 65% of the population is unemployed due to their direct and indirect association with the collapsing fishing industry.
Mamobi
The predominant occupation of the respondents in Mamobi is dressmaking/tailoring and trading. More women than men are engaged in trading. (See table 4.8a appendix A on gender and occupation of residents of Mamobi)

12.1.2

12.1.3 Where are the residents located?
All respondents live in shared or multiple household units (compound homes), where they share with other extended family members as well as non-family members (See further discussion in appendix C).
The data obtained from the two studies from key informants and through focus group discussions revealed that each member of the family had equal rights to live in a family house, no matter whether two or three generations down the line, provided her forebears had a room(s) in the house.
It was revealed that close family members could ask permission and build an attached room or structure to the main house in case they felt they were over crowed. It was revealed that on average 8 to 15 people could share a room. This was because they were members or relatives from the same ethnic group who needed accommodation. Hence, this made them co-exist in harmonious relations. It was generally realised that the nature of residential patterns is a clear indication of a multiple households within a single compound house.

12.1.4 What do the residents have – access to basic services

All participants indicated that access to basic services was based on ones economic status and ability to afford. However, it was evident that the residents of Teshie were in a more disadvantaged position than the residents of Mamobi in terms of ownership of both monetary and non-monetary assets owing largely to their low socio-economic status. Within Mamobi there were substantial disparities as it became obvious that west Mamobi was better off than east Mamobi due to its socio-economic status which can pass for middle class typology.

12.1.5

12.1.6 What do the Mamobi residents know – access to information

The educational attainment level is one of the major determinants of the market situation of individuals in every country. In other words, one's level of education largely determines a person's position in the labour market or the type of occupation the individual is likely to be involved in.

Data on the educational background reveal that the majority of respondents have received some form of basic education, with more women in this category than men in all areas visited (see table 4.5 in appendix A). However, the categories secondary and tertiary have more men than women with some spatial variations.

Overall, the data obtained from the two studies reveal that the educational level of the people is not very high. Half of the respondents indicated to have had no education or only basic education. Comparing the two communities, we see that the residents of Mamobi, especially West Mamobi are relatively better off than Teshie which has more illiterates (See tables 4.6a &b in appendix A and appendix C for more information on the areas).

12.2 Excluding groups from adequate drinking water supply

This section examines access to basic social services which mean the type of house respondents live in and its connectivity to water and sanitation services, and their existing rights to these services and their ability to purchase available services, assets which enable you to derive benefits from the available services.

According to the Joint Monitoring Programme (JMP) 88% of the urban population in Ghana has access to an improved drinking water source (JMP, 2004). Of the 36 high density areas in Accra, 26 areas (72%) have a medium to a severe water situation. Of the 30 low density high class areas, there are only 9 areas (30%) having medium severe to a severe water situation. All densely populated, poor and indigenous areas were characterised as areas with medium to highest severe burden when it comes to water supply. The worst areas include Nima, Sabon Zongo, Accra New Town, Mamobi and Apenkwa.

The results obtained from the two studies show that most houses in Teshie and Mamobi are not connected to the supply from the Ghana Water Company Limited. However, unlike Teshie, some of the households in Mamobi indicated that they are connected to the supply of the Ghana Water Company but confirmed the running has been irregular due to the topography of the land (See figure 4.3.2 for some exposed water connections in Mamobi).

"There is no water in the home; we have to get our own water" [Male, 52years-Teshie].

"We have no pipe borne water in our house so we have to go outside to fetch some [female, 24 years-Mamobi].

It was also realised that due to the unavailability of water in the homes, residents of both Teshie and Mamobi had to walk long distances to nearby communities in search of water or rely on private water vendors who charged exorbitant prices. The prices charged depended on the size of the bucket/basin or what they termed the "kuffour gallon" (yellow oil gallons).

"Water is sometimes very expensive here, especially when the problem is serious. The yellow kuffour gallon ranges from 15p to 25p (EUR 0.07 to 0.12). However, if there is no water the vendors charge as much as 30p (EUR 0.15) for the small gallon and between 45p- 50p (EUR 0.22 – 0.25) for the large kuffour gallon….(female 43 years ,Mamobi).

Figure 4.3.1 Women and Children queuing for water as they buy in different size of gallons in Teshie

Source: Author's field work, 2009.

The coping mechanism adopted by residents of Teshie in the face of scarcity of water or where respondents did not have money to buy water was to bathe in the sea or to avoid bathing altogether while residents of Mamobi took advantage of the numerous public baths in the community or stay away from bathing at all just like what pertains in Teshie (See fig.4.3.3a and b in Appendix B for children and adult swimming in the sea as substitute for bathing).

"Sometimes I will not bath, if I feel sticky, I just go to the beach and swim after that the cup of water I have begged for to rinse myself. I will use the money I have for food, even with that you cannot get, how much more to buy water to bath (female, 29 year-Teshie)

"When I do not have money to buy water, I have to sleep without bathing or in some situations buy a full sachet of water for GH¢1.00 (EUR 0.50)" [male 34 years-Mamobi].

Generally, it was evident that availability of water was huge problem for both residents of Teshie and Mamobi. However, Teshie was relatively better off than Mamobi. Teshie boasts of public water points which were provided for by the assembly while all the public water points in

Mamobi were owned by private individuals and this consequently increased the prices charged for water.
It can therefore be concluded that households in Teshie and Mamobi found it extremely difficult to get access to potable water for their routine daily activities. In such circumstances, it is women and children who are the profoundly affected group. It is therefore expedient that an immediate solution is found to arrest the problem. (See figure 4.3.4 in appendix B for young girls scavenging for water. See also appendix C for further discussions on the issue of water).

12.3 Excluding groups from safe sanitation services

12.3.1 Access to toilet facilities

Around 2.5 billion people in the world do not have access to a basic toilet and poor sanitation kills one child every 17 seconds It is estimated that 221 million people still defecate in the open in Sub-Saharan Africa and one billion children do not have access to a basic toilet and 1.2 billion people have no facilities at all (DFID, 2009).
Access to adequate and improved sanitation services in Accra is generally poor. The sanitation situation in all high density areas (100%) has been characterised as medium to very severe while only 6 out of 30 (20%) low density areas had a medium to very severe sanitation situation (Population and Housing Census, 2000).
In Ghana, the 2000 population and housing census revealed that 31.45 per cent households used public latrines as compared to 8.5 per cent using water closet; 22 per cent used pit latrine, 6.9 per cent used KVIP, four per cent used bucket or pan latrine and 6.9 per cent attend to nature's call in other people's houses. (Population and Housing Census, 2000).
The results obtained from the two studies revealed that most houses were built without any provisions for toilets facilities and therefore respondents had to resort to alternative means to ease themselves.
Respondents indicated that most of the landlords have rather chosen to build more rooms for rentals instead of constructing more toilet facilities:

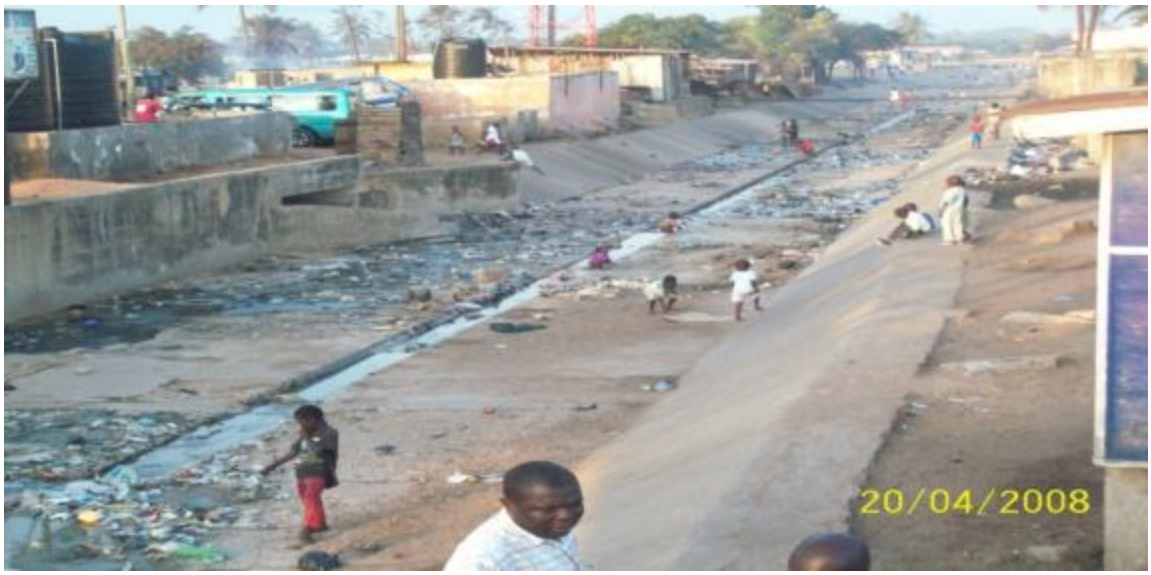
> *"The toilet situation is bad. Most of the landlords think about their rents than the toilet facility. There are houses where there are no toilet facilities. The landlords build their houses everywhere even at places where they are supposed to construct a toilet" [Key informant- Elders]*. See appendix C for further discussions on toilet facilities

> *"There is no toilet here [Lenshie], unless you go to the other side [Addomin] (female 18 years-Teshie)".*
> *"There is no toilet in our house, we attend a public toilet which is located at our backyard and we pay 10 pesewa (EUR 0.05)" [Female, 18years-Mamobi]*.

Due to the unavailability of toilet facilities at the household level, residents either had to attend the public toilets, use the seashore or defecate in black polythene bags during the night and dump it indiscriminately. Open space defecation was more prominent in Teshie due to its proximity to the sea, it was not found in Mamobi.

> *"We do everything [defecate and bath] at the seaside (beach), both the elderly and the young. If you are too old and cannot go to the seaside, then you must get a takeaway bag [referring to black poly] bag, go to toilet [defecate] in it and throw it away (female 47years).*

Figure 4.3.6 People defecate in the main drainage system in Kponkpa (Teshie)



Source: Author's field work, 2009.

Moreover, respondents from both Teshie and Mamobi alluded to a myriad of problems they encounter in their quest to utilize the few public toilets. The problems range from distance, poor illumination, and insecurity especially for women during the night to prices charged.

"…At midnight because of security reason due to the distance and poor lighting system, some use polythene bag to ease themselves and dump it at any convenient place"[Female, 18 years].

"….There is always a cue and because of this when you walk through the backyard you see a lot of polythene bags which contain faeces because at night when people cannot go to the public toilet they have to do in their own way"[female 47 years married].

However, it was observed and revealed that Mamobi's public and private toilets were better off than the ones in Teshie. Illumination seemed better and Mamobi also has more public toilets facilities than Teshie. In Mamobi individuals have constructed modern flush toilets which are open to the public (See fig. 4.3.7a and b in appendix B for public toilets in Teshie and Mamobi).

12.3.2 Access to bathing facilities

Information obtained from Teshie revealed that most of the houses were put up without any bathroom facility. The study also revealed that the houses along the seashore had bathrooms which had been converted overtime into bedrooms or places of human abode because of the increase in family size and lack of accommodation.

As such respondents either patronized the public bath which had no showers or used the sea shore while few respondents indicated that bath facility were available in their homes. Yet still others took their bath in open spaces. It was observed that about 41% of the respondents used the sea shore as their place of bath while 36% settled for the public bath. Fourteen percent (14%) of the people indicated that they bathed in open spaces while the remaining 9% of the respondents were fortunate to have bath facility in their homes.

"There is not enough public baths here, I usually use the beach" [Male, 25years-Teshie].

In terms of accessibility to bath facilities, Mamobi appeared to be better off than Teshie especially West Mamobi where the majority of the modern house is furnished with a bath facility based on the findings. Although about 90% of houses in East Mamobi did not have bath facility, the community abounds in public bath as private individuals had built public bath houses with

showers where they even soap and sponge are provided for people to buy. However, respondent stated that these were not free as the owners charged between 20p and 25p maintaining that this was rather more convenient to use the public bath, because the places were well kept and water was readily available. .
The difference that was identified was that the public bath houses at Teshie were donated by social groups which did not provide showers, that is they are open tops and patrons had to use their own water (this particular was free) whereas those at Mamobi were privately owned by individuals who had the means. (See fig 4.3.8a and b for public bath house in Teshie and Mamobi).
An additional problem, at least in Teshie, was that the security of women was not guaranteed as public bath facilities, as the places had no roofs and the doors had no latch or locks in the case of Teshie as compared to Mamobi (West).
Generally, it was realized that the situation in Mamobi was better in terms of availability as a lot of private individuals had put up public places of bath where a fee is charged. Notwithstanding this, the overall situation in both Teshie and Mamobi is not ideal since it is expected as a matter of necessity that every house should be provided with bath facility.

12.3.3 Access to solid and liquid waste services

Waste disposal and management has been a perennial problem in most developing countries and Ghana is no exception. Management of solid and liquid wastes remains a challenge globally. However, the situation is exacerbated in the global south or in the developing countries where institutional and technological know-how are still being sought for.
It was realized from the two studies that both solid and liquid wastes were generated by the people predominantly from their domestic activities of washing, bathing and cooking.

Dumping waste in the drains and the sea

With respect to the disposal of liquid waste, it was observed from Teshie and Mamobi that drains were woefully inadequate and consequently encouraged residents to either throw the waste on the compound or sent to the seashore as happens in Teshie. It was just one area in Lenshie that had an underground drainage system.

> *"We don't have drains, so when we wash, we just throw them around. If the water is plenty, we ask the children to send it to the seaside" (female 32 years-Teshie).*

In relation to solid waste disposal, it was ascertained from Teshie and Mamobi that refuse containers were inadequate (See also fig. 3.5.2 in appendix B for drains being used as dumping site in Mamobi).
"*We don't have any refuse container here (area near the sea) I send all my rubbish to the sea"(female 32 year-Teshie).*
*"The day that I don't have money I wait in the evening, then dispose of it in the gutter. That is what most of us do here" [*Female 28yrs-Teshie].

Figure 4.3.9 Drains turned into dumping site in Teshie

Source: Author's field work, 2009.

Even though it was revealed that there were public refuse containers in most of the vicinity, it was realized that household waste was littered everywhere in black polythene bags owing to the prices charged for dumping. However, the prices charged at Mamobi was found to be higher than what pertains in Teshie due to the private nature of the services provided which was carried out by Zoomlion (See fig, 4.3.10 in appendix B for the tricycle used by Zoomlion).

> *"It is expensive even with small size waste is 20p (EUR 0.10)[female28].*
>
> *"This problem has been eased by Zoomlion. There are also private individuals who to carry rubbish from various houses at a fee" [FGD].*

Generally, it has emerged from the study at both Teshie and Mamobi that solid and liquid waste disposal and management is very poor. The liquid waste generated mainly from washing, bathing and cooking are thrown about indiscriminately due to the absence of drains and inadequate refuse containers as well as irregular lifting of garbage. The refusal and delay of authorities in lifting containers is a clear sign of marginalisation of its residents as this has health implications on the already vulnerable population. Residents living around the area complained of the sting that emanated from the place. They indicated that they usually catch cold, malaria and sometimes cholera (See appendix C for further details).

12.4 Excluding groups from adequate protection for urban floods

Twumasi and Asomani-Boateng (2002) identified two major types of flooding which occur in Greater Accra. One type, from local ephemeral watercourses, occurs following a prolonged local rainstorm. These watercourses include Densu, Korle Lagoon,Kpeshe, Sakumo, and Songo. The areas occupy lower level grounds within the metropolis and are therefore prone to flooding following exceptionally wet rainy seasons. The second type refers to flooding as the result of rainfall and diffuse overland flow. Local heavy rainstorms can produce street flooding and overland flow.

Causes of flooding

It is against this background that the study sought to identify the causes, nature and extent of the flood they experience. Respondents attributed the causes to heavy rainfall, and high rise in the sea level as well as the inadequate and poor nature of drainage systems.

> *"The floods are caused by the waters which gathers from 37and Osu area when it rains and flows downwards to this area. There are some big gutters up there which join together and flowdownstream here. Also, all the waters from Achimota, Adsirigano Balewashie and the surrounding all flow down to this place." (male 63 years-Teshie)*
>
> *"When it rains our building gets broken down as you can see. We have complained about the rubbish they throw in the gutter (storm drains) but they always insult us that the gutter is not for our father" [Male, 66 year-Mamobi]. .*

Figure 4.3.11a Floods destroy some buildings in Kponkpa as a result of stagnant water and lack of drains (Teshie)

Source: Author's fieldwork, 2009.

One difference that was observed with respect to the causes of flooding in Mamobi and Teshie is the rise in sea level. This was a cause only the respondents in Teshie pointed to. It was not found in Mamobi due to its distance from the coastline (See fig. 4.3.11a in appendix B for some houses along the storm drains being destroyed by flood in Mamobi).

Respondents from both Teshie and Mamobi recounted the unpleasant and life threatening conditions they always found themselves in, especially women and children, anytime there was flooding.

Support from the government

Another observation that was made by both Mamobi and Teshie residents was that no assistance or relief items have been made available to these victims. Respondents indicated that NADMO officials have visited the place but nothing concrete has been done to alter their plight though NADMO officials gave contrasting reports with the statement that assessment teams did visit the place to take some vital statistics and that they later provided rice and blankets to the people.

"We have not gotten any relief service from anybody. The main problem with the drainage system is that it weakens the foundation of the building breaking down houses. There is nothing one can do than to solicit help from the government" [Female, age 27].

*"No assistance so far has been given to us since we started suffering from these floods ...we are poor already so the little that we go and sell our fish to get our daily bread will be cut off. We suffer a lot when these floods occur" (*Male 72 years-Teshie)

Access to information

With respect to access to information regarding the rains and flooding from government officials (metrological service) to enable them prepare, the data obtained from Teshie and Mamobi suggested that respondents were not in the known. In a nutshell, floods make enormous impact on the society and the environment. It also has huge psycho-social effects on flood victims and their families and can traumatize them for long periods of time.
Therefore, the exigencies of the situation call for a concerted effort by all stakeholders to find sustainable remedies to the perennial flooding.

13 Conclusion and recommendations

Social exclusion is evident both in Old Teshie and Mamobi. There is a great need for improved access to potable water and toilet facilities. Safe disposal of solid waste is a challenge too. In addition to this, part of the Teshie and Mamobi residents live in a flood-prone area. Each flood makes the residents poorer than before due to loss of property and livelihoods. Although some causes are beyond the control of the residents, such as the rise of the sea level, other causes such as inadequate drainage or blocked gutters could be addressed. That is, if the residents were supported to do so.

- The findings call for the need of participatory planning, implementation and monitoring of basic social amenities, together with community members and with a clear focus on the different gender roles, responsibilities and needs, the high population density and the economic status of community members.

- Increase access to water supply and toilets, and make access affordable by taking into account the economic status of the community members, the high population density and low class areas.

- Provision of adequate security at public or shared toilet facilities and improvement in the overall lighting system at the site. Establishment of community watch-dog to man these places to ensure the safety of users of the facility, especially women, children and the elderly, during the night.

- The communication channels used to inform and to warn residents should be adapted to the needs of the residents.

- Create awareness on the national laws with regards to inheritance and child maintenance and support, and human rights of especially women and children.

- Gender needs assessment should be carried out in flood prone areas and basic support should be provided to meet the practical needs of victims to mitigate their plight.

- Equitable distribution of economic resources and special attention to deprived communities in order to bridge the gap between the privileged and the least privileged.

- Construction of more drainage systems and gutters adapted to the local context, that is: deeper and wider as the current ones.

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15 Appendix A: List of tables

Table 2.0a **Number of participants based on gender (Mamobi)**

	MEN	WOMEN	TOTAL
Respondents	11	13	24
Key informants	9	5	14
	Focus group		
A (Mixed)	8	7	15
B(Mixed)	10	4	14
C (Men only)	17	0	17
D (Women only)	0	14	14
E women only		16	16

Table 2.0 b Numbers of participants based on gender (Teshie)

	MEN	WOMEN	TOTAL
Respondents	12	10	22
Key Informants	9	3	12
Focus Group			
A (Mixed)	5	7	12
B (Mixed)	8	11	19
C (Men Only)	28		28
D (Women Only)		18	18
E (Children)	6	9	15

Source: Author's field work, 2009.

Table 4.1 Gender and Age Distribution of respondents (Mamobi and Teshie)

Age (years)	Men	Women	Total
< 20	0 (0)	4 (1)	2 (1)
21 -29	22 (5)	22 (5)	22 (10)
30-39	17 (4)	22 (5)	20 (9)
40- 49	22 (5)	30 (7)	26 (12)
50 above	39 (9)	22 (5)	30 (14)
Total	100 (23)	100 (23)	100 (46)

Source: Author's fieldwork, 2010

Table 4.2a Age of Respondents by Gender (%) -Mamobi

Age (years)	Men (%)	Women (%)	Total
21-29	**18 (2)**	**23 (3)**	**20 (5)**
30-39	**18 (2)**	**23 (3)**	**20 (5)**
40-49	**27 (3)**	**30 (4)**	**29 (7)**
50-59	**18 (2)**	**15 (2)**	**16 (4)**
60 above	**18 (2)**	**7 (1)**	**13 (3)**
Total	**100 (11)**	**100 (13)**	**100 (24)**

Source: Author's fieldwork, 2010

Table 4.2b Age of Respondents by Gender (%) -Teshie

Age (years)	Men	Women	Total
< 20	0 (0)	10 (1)	5 (1)
21 -29	25 (3)	20 (2)	23 (5)
30-39	17 (2)	20 (2)	18 (4)
40- 49	17 (2)	30 (3)	23 (5)
50 above	42 (5)	20 (2)	32 (7)
Total	100 (12)	100 (10)	101 (22)

Source: Authors fieldwork, 2010.

Table 4.3 **Gender and Marital Status of respondents in Teshie and Mamobi**

	MEN (%)	**WOMEN (%)**	**TOTAL (%)**
Married	65 (15)	61 (14)	63 (29)
Single	30 (7)	17 (4)	24 (11)
Divorced/Separated/widowed	0 (0)	22 (5)	11 (5)
Consensual union	4 (1)	0 (0)	2 (1)
Total	**100 (23)**	**100 (23)**	**100 (46)**

Source: Author's field work, 2010.

Table 4.4a Gender and Marital Status of respondents – Mamobi

	MEN (%)	**WOMEN (%)**	**TOTAL (%)**
Married	**55 (6)**	**62 (8)**	**58 (14)**
Single	**45 (5)**	**23 (3)**	**33 (8)**
Divorced/Separated	**0 (0)**	**15 (2)**	**8 (2)**
Total	**100 (11)**	**100 (13)**	**100 (24)**

Source: Author's fieldwork, 2010

Table 4.4b Gender and Marital Status - Teshie

	MEN (%)	**WOMEN (%)**	**TOTAL (%)**
Married	**75% (9)**	**60 (6)**	
Single	**17 (2)**	**10 (1)**	
Divorced/Separated/widowed	**0 (0)**	**30 (3)**	
Consensual union	**8 (1)**	**0 (0)**	
Total	**100 (12)**	**100 (10)**	

Source: Author's field work, 2010.

Table 4.5 Gender and Educational attainment levels of Respondents: - Mamobi and Teshie

	MEN (%)	**WOMEN (%)**	**TOTAL (%)**
No Education	**26 (6)**	**22 (5)**	**24 (11)**

Basic Education	**35 (8)**	**61 (14)**	**48 (22)**
Secondary	**22 (5)**	**13 (3)**	**17 (8)**
Tertiary	**17 (4)**	**4 (1)**	**11 (5)**
Total	**100 (23)**	**100 (23)**	**100 (46)**

Source: Author's field work, 2010.

Table 4.6a Gender and Educational attainment level of Respondents Mamobi

	MEN (%)	WOMEN (%)	TOTAL (%)
No Education	9 (1)	7 (1)	8 (2)
Basic Education	45 (5)	69 (9)	58 (14)
Secondary	27 (3)	23 (3)	25 (6)
Tertiary	18 (2)	0	8 (2)
Total	100 (11)	100 (13)	100 (24)

Source : Author's fieldwork, 2010

Table 4.6b Gender and Educational attainment levels of Respondents: - Teshie

	MEN (%)	WOMEN (%)	TOTAL (%)
No Education	42 (5)	40 (4)	41 (9)
Basic Education	25 (3)	50 (5)	36 (8)
Secondary	16.7 (2)	0 (0)	9 (2)
Tertiary	16.7 (2)	10 (1)	14 (3)
Total	100 (12)	100 (10)	100 (22)

Source: Author's field work, 2010.

T able 4.7 Gender and Occupation of Respondents: Teshie and Mamobi

OCCUPATION	MEN (%)	WOMEN (%)	TOTAL (%)
Trader	8.7 (2)	30.4 (7)	19.7 (9)
Artisan	21.7 (5)	0 (0)	10.9 (5)
Dress Makers	21.7 (5)	26.1 (6)	23.9 (11)
Public Service	8.7 (2)	13.0 (3)	10.9 (5)
Kenkey Sellers	0 (0)	8.7 (2)	4.3 (2)
Fishing Industry	17.4 (4)	13.0 (3)	15.2 (7)
Students	4.3 (1)	0 (0)	2.2 (1)
Unemployed	17.4 (4)	8.7 (2)	13.0 (6)
Total	100 (23)	100 (23)	100 (46)

Source: Author's fieldwork, 2010.

Table 4.8a Gender and Occupation of respondents-Mamobi

	MEN (%)	WOMEN (%)	TOTAL (%)
Trader	18 (2)	38 (5)	29 (7)
Artisan	27 (3)	0 (0)	13 (3)
Dress Makers	45 (5)	46 (6)	45 (11)
Public Service	9 (1)	15 (2)	13 (3)
Total	100 (11)	100 (13)	100 (24)

Source: Author's fieldwork, 2010.

Table 4.8b Gender and Occupation of Respondents: Teshie

OCCUPATION	MEN (%)	WOMEN (%)	TOTAL (%)
Petty Trading	0 (0)	20 (2)	9.1 (2)

Artisan	**17 (2)**	**0 (0)**	**9.1 (2)**
Public Service	**8 (1)**	**10 (1)**	**9.1 (2)**
Kenkey Sellers	**0 (0)**	**20 (2)**	**9.1 (2)**
Fishing Industry	**33 (4)**	**30 (3)**	**31.8 (7)**
Students	**1 (1)**	**0 (0)**	**4.5 (1)**
Unemployed	**33 (4)**	**20 (2)**	**27.3 (6)**
Total	**100 (12)**	**100 (10)**	**100 (22)**

Source: Author's field work, 2010.

Table 4.9 Ethnic Background of respondents: Teshie and Mamobi.

Ethnicity	Frequency	Percentage (%)
Ga-Adangbe	17	37.0
Akan	8	17.4
Northners (Chamba, Mamprusi,Kotokoli)	16	34.8
Ewe	5	10.9
Total	46	100

Source: Author's fieldwork, 2010.

Table 4.10a Ethnic Background of Respondents: Teshie

Ethnicity	Frequency	Percentage (%)
Ga-Adangbe	17	72
Akan	6	28
Total	23	100

Source: Author's fieldwork, 2010.

Table 4.10b Ethnic Background of Respondents: Mamobi

Ethnicity	Frequency	Percentage (%)
Northners(Chamba,Kotokoli,Mamprusi)	16	70
Ewe	5	20
Akan	2	10
Total	23	100

Source: Author's field work, 2010.\

16 Appendix B: List of figures

Fig.3.1a A Map of Teshie

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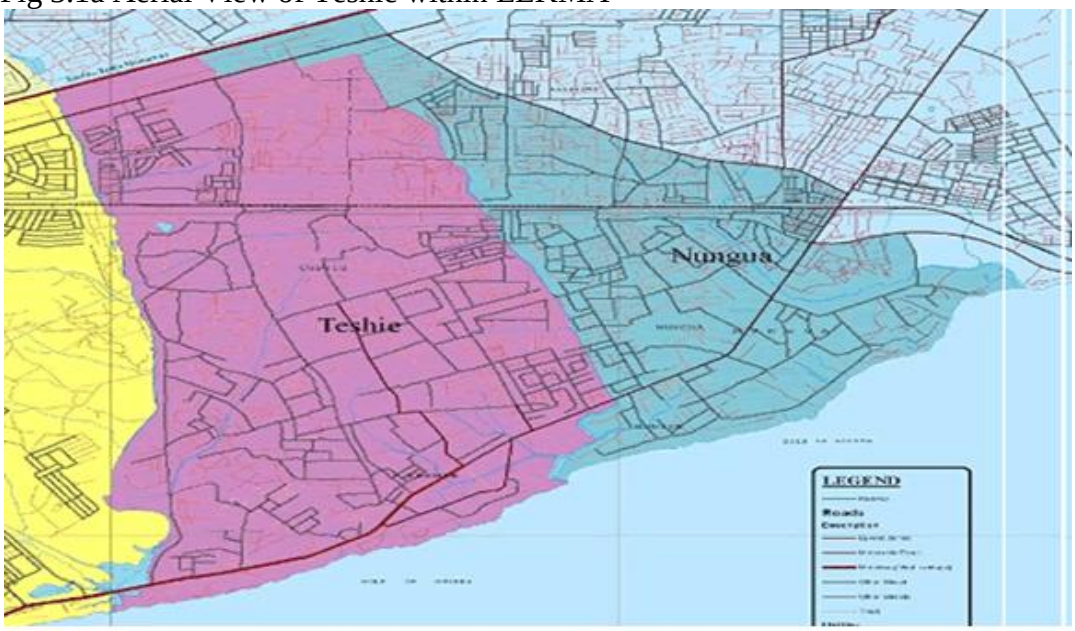
Fig 3.1a Aerial View of Teshie within LEKMA



Source: LEKMA, 2008.

Figure 3.2 Map of Mamobi

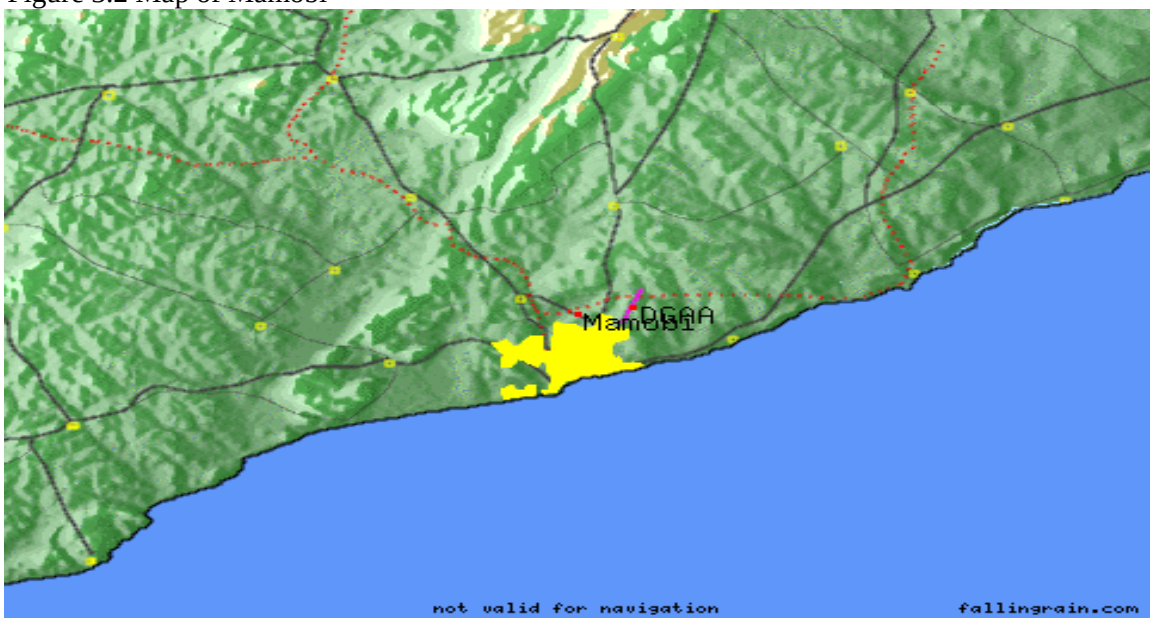


Fig 4.3.2 Some exposed water connection lines in Mamobi

Source: Author's field work, 2010.

Figure 4.3.3a Bathing in the sea: Children use swimming in the sea as a substitute for bathing in the face of water scarcity (Teshie).

Source: Author's field work, 2010.

Figure 4.3.3b Adult swim as a substitute for bathing in Teshie

Source: Author's field work, 2009.

Figure 4.3.4 Young girls bear the burden of scavenging for water for the household

Source: Author's field work, 2009.

Figure 4.3.5a The use of Water Tank supply in Mamobi

Source: Author's field work, 2009.

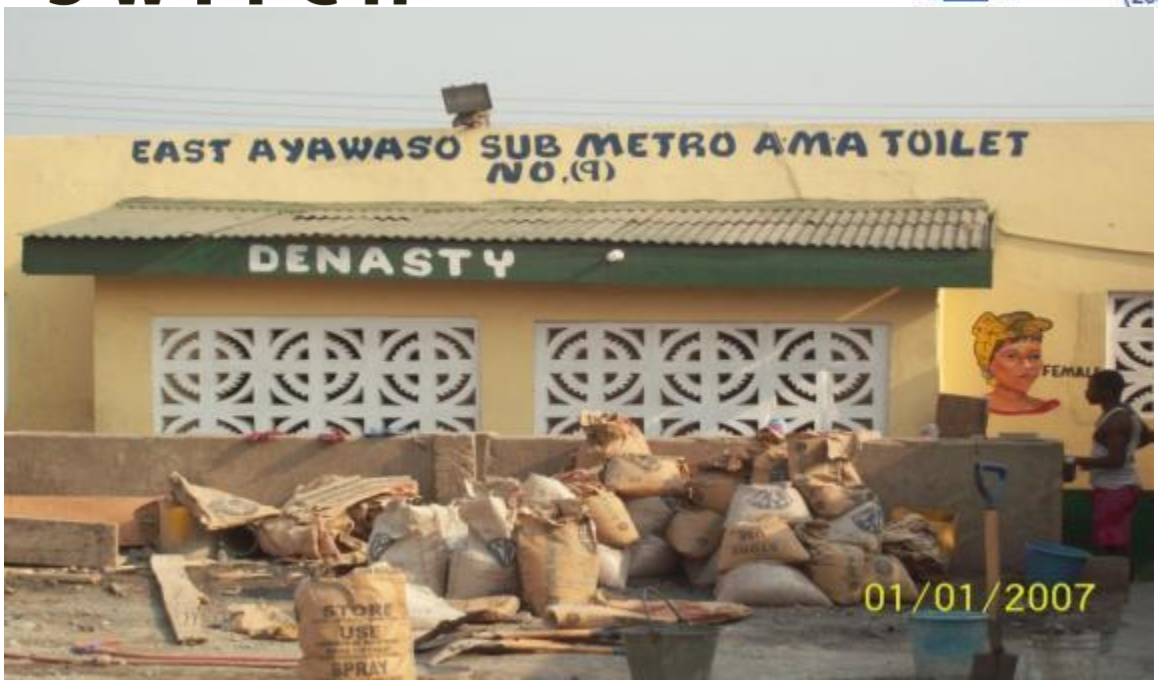
Figure 4.3.5b Private Water point in Mamobi

Source: Author's field work, 2009.

Figure 4.3.8a A Public Toilet in Teshie

Source: Author's field work, 2009.

Figure 4.3.8b A Public Toilet in Mamobi



Source: Author's field work, 2009.

Figure 4.3.10 Private waste collector in Mamobi

This is a waste collecting tricycle owned by a private waste company working in Mamobi east.

Source: Field work, 2010.

Figure 4.3.11b Some Houses along the Storm Drains being destroyed by Flood (Mamobi

Source: Author's fieldwork, 2009.

018530 - SWITCH

Sustainable Water Management in the City of the Future

Integrated Project
Global Change and Ecosystems

Deliverable D6.3.1a
Situation Analysis Social Inclusion Alexandria
Due date of deliverable:M 6
Actual submission date: M48

Start date of project: 1 February 2006 Duration: 60 months

Dr. Khaled Abuzeid
CEDARE

Revision [final]

Project co-funded by the European Commission within the Sixth Framework Programme		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the	
RE	Restricted to a group specified by the consortium (including	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Social Inclusion in Urban Water Management in Alexandria: Situation Analysis

CEDARE 2009

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Executive summary

Under the umbrella of SWITCH Project, which aims to bring about a change in urban water management away from existing ad hoc solutions and towards a more coherent and integrated approach, this report was prepared to provide insight into the existing situation in Alexandria through analyzing different aspects related to existing urban water management in Alexandria and highlighting the status of social inclusion.

The report consists of four main sections. The first section, which is an introductory part, introduces SWITCH project, various considerations of urban water management and social inclusion concepts. The second section provides the comprehensive profile for Egypt in terms of country context and drinking water sector. The third section highlights the main socioeconomic conditions and water as well as sewage provision in the city of Alexandria. The fourth and final section of this report, presents a conclusion of the report and main results.

1.1. SWITCH Project: An introduction

1.1.1. SWITCH

Current global change pressures, escalating costs and other risks inherent in conventional urban water management are making it increasingly difficult to efficiently manage scarce water resources. Also, satisfying water demand and waste water disposal without creating environmental, social or economic damage is a growing challenge.

SWITCH is the name of a five year action research programme, co-funded by the European Commission and implemented by a cross-disciplinary team of 33 partners and 13 cities in 15 countries around the world.

SWITCH aims to bring about a change in urban water management away from existing ad hoc solutions and towards a more coherent and integrated approach. The vision of SWITCH is for sustainable integrated urban water management in the 'City of the Future'. Clearly this City of the Future is a City for all.

1.1.2. Consideration of urban water management

Generally, water management in urban areas should be based on certain considerations such as full participation by all stakeholders, considering social dimensions, capacity building, availability of information, cost recovery, adopting the best existing technologies and practices, reliable and sustained financing, equitable allocation of water resources.

Full participation by all stakeholders involves new institutional arrangements such as high level of autonomy, transparency and accountability for all decisions. High level of autonomy requires changing role of central government that should convert to support through the creation and maintenance of an enabling environment. The role of central government should aim at facilitating and coordinating the development and transfer of skills, and assisting with the provision of technical advice and financial support.

Considering social dimensions necessitates the use of social impact assessments, workplace indicators and other tools to ensure that the social dimension of a sustainable water policy is implemented. This will include the promotion of equitable access, enhanced role of women, and the employment and income implications of change.

In many cases stakeholders lack the necessary knowledge and skills for full application of water management. Stakeholders may not be familiar with some concepts of water management, corporate governance, and their role in these. The water stakeholders must, therefore, collaborate in designing and implementing strategic elements of capacity building as part of the evolving integrated water management process. Capacity building schemes may include, for example, education and raising awareness about water; information resources for policy making; regulations and compliance.

Availability of information and the capacity to use it to make policy and predict responses implies sufficient information on physical, economic, social and environmental characteristics of a community to allow informed policy choices to be made.

The rationale of full-cost pricing principle that is complemented by targeted subsidies is that users do not value water provided free or almost free and have no incentives to conserve water. The economic sustainability of water and sanitation services depends largely and

appropriately on the recovery of costs through user fees or tariffs that are equitably assigned based on ability-to-pay. It should be noted that full-cost pricing should not be applied in its narrowest sense to maintain the principle that water is a public good, a human right, and not simply an economic good. This means that there should a way to strike a balance between treating water as an economic good and equity and water as a basic good. There are in this respect, certain measures that assist in striking such a balance, e.g. block pricing of water, which would provide lower price blocks for the minimum water needs, with the higher quantities involve higher price blocks.

Reliable and sustained financing means a clear and long-term commitment from government to provide financial and human resources support In order to ensure successful implementation of water management approaches. This is complemented by income from a healthy water and sanitation market.

Equitable allocation of water resources implies improved decision-making, which is technically and scientifically informed, and can facilitate the resolution of conflicts over contentious issues. In this context, there are existing tools (e.g. multi-criteria analysis) to help decision-making in terms of balancing social, ecological and economic considerations. These should be tested and applied. In order to achieve equitable allocation, water should be recognized as an economic good. Accordingly, water allocations should be optimized by benefit and cost, and aim to maximize water benefits to society per unit cost.

Strengthening the role of women in water management means ensuring women's participation in decision-making that may positively affect both water management process and sustainability.

It could be argued that IUWM covers wide range of topics that deal not only with technical aspects but also with multi-dimensional social aspects and involvements of all stakeholders. In this respect, social inclusion, among other social aspects, should be reflected highly in IUWM studies.

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1.1.3. Social Inclusion

The inclusion of formally excluded groups is the focus of the Social Inclusion Work Package. Social inclusion is highlighted here to capture both individual wellbeing and the broader benefits of social cohesion. Social inclusion/exclusion relate to many different domains of potential deprivation (e.g. physical, psychological, economic, social and political). It could be argued that focusing on the inclusion/exclusion nexus encourages consideration of capabilities broader than income. This would in turn assist agencies and actors responsible for inclusion and exclusion, in dealing with the challenges posed in addressing marginalisation (e.g. diversity versus homogenisation).

Social inclusion/exclusion is complex and context specific and can be defined by the following four inter-related questions:

- Who you are – ethnicity, gender, age, social status, etc
- What you have – monetary and non-monetary assets
- Where you are – proximity to basic services, location within the city, etc.
- What you know – access to information

To ensure a social inclusive change process, the following activities are planned for the Social Inclusion WP:

- Series of briefing notes and background papers
- Series of good social inclusion practices
- Qualitative situation analysis in Accra and Alexandria to gain a better understanding of social exclusion mechanisms.
- Inputs in demonstration activities undertaken by other work packages including baseline study and impact monitoring.

1.2. Report objective

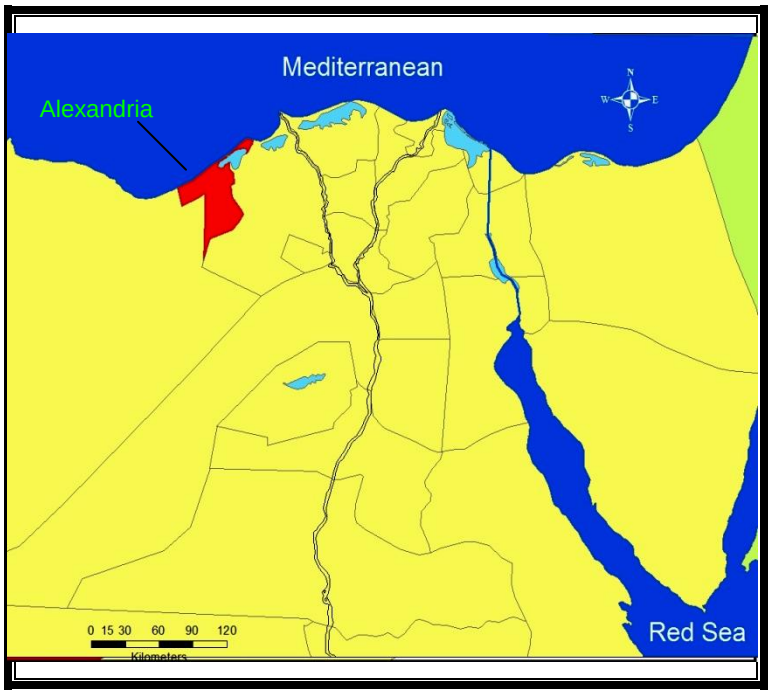
Under the umbrella of Switch project the current situation analysis study (report) aims at providing insight into the existing situation in Alexandria through analysing different aspects related to existing urban water management in Alexandria and highlighting the forms of social exclusion, if any. Such an analysis can support the process of optimizing social inclusion at the governorate level.

2. Egypt

2.1. Country context

Egypt is one of the oldest societies in the world. It is located in Northern Africa, bordering the Mediterranean Sea, between Libya and the Gaza Strip, and the Red Sea north of Sudan, and includes the Asian Sinai Peninsula. The country has been experiencing high rates of population growth, with its population doubling over thirty years between 1976 and 2007 (Figure 1). Egypt, which covers slightly more than million km^2 of land, is one of the most densely countries with about 72 million people living over an inhibited area of no more than 6% of its

total area[17]. The remaining land in Egypt is desert. Administratively, Egypt is divided into 28 governorates *{Muhafazat}* (Map1)[18].



Map (1): Egypt, administrative division

Egyptian society has, in the last three decades, went through successive socio-economic changes, some of which were attributed to economic restructuring and privatisation programs adopted by the government in the 1990s. Others were due to geo-political changes at the regional level[19]. Despite efforts by the government, NGOs and international and regional agencies throughout the 1990s, the unemployment rate in the year 2000 reached 28% for the age groups between 15 and 25 years as compared to the overall rate of 9.8%. 2006 Census indicated that the overall unemployment rate reached 9.72%[20]. Still, the high unemployment rate, among the 15-25 years age group, led to increased hardship and a sense of insecurity among individuals. This has led, it was argued, to continuing population growth as children were seen, by some low-income communities, as economic asset as well as social safety net to the elderly[21].

Parallel to that, Egypt has been experiencing rapid rate of urban growth, in absolute terms (Figure 1). As most urban centres in Egypt are located in the Nile valley and Delta where most fertile agricultural land exists, there was considerable encroachment on agricultural land. It could be argued that a large proportion of this urbanisation took the form of informal settlements, which normally spread on the peripherals of existing urban centres. Such a trend increased the pressure on urban infrastructure and services, including water and sanitation. Accordingly, the government adopted a national programme for upgrading informal settlements, which included the provision of water, sanitation and electricity to their residents. The overall percentage of provision of water in Egypt is generally higher than that for sewage provision (Figures 2: a & b).

[17] El-Saharty, S., Gail Richardson and Susan Chase, February, 2005, Egypt and the Millennium Development Goals Challenges and Opportunities, (Health, Nutrition and Population (HNP) Discussion Paper), The World Bank, Washington, DC.

[18] Recent modifications of administrative borders added two governorates next to Greater Cairo Region namely; Helwan and Sixth of October.

[19] For instance, the first and second Gulf wars, which forced significant number of Egyptian workforce in the Gulf to return to Egypt

[20] CAPMS, 2007, Aggregate Results of 2006 Census, CAPMS, Cairo

[21] Eliesh, S., November 2004, Combating Labour Insecurity in Egypt Do “NGOs” have a Significant Role to Play?, International Labour Organization (ILO), International Labour Office, Geneva.

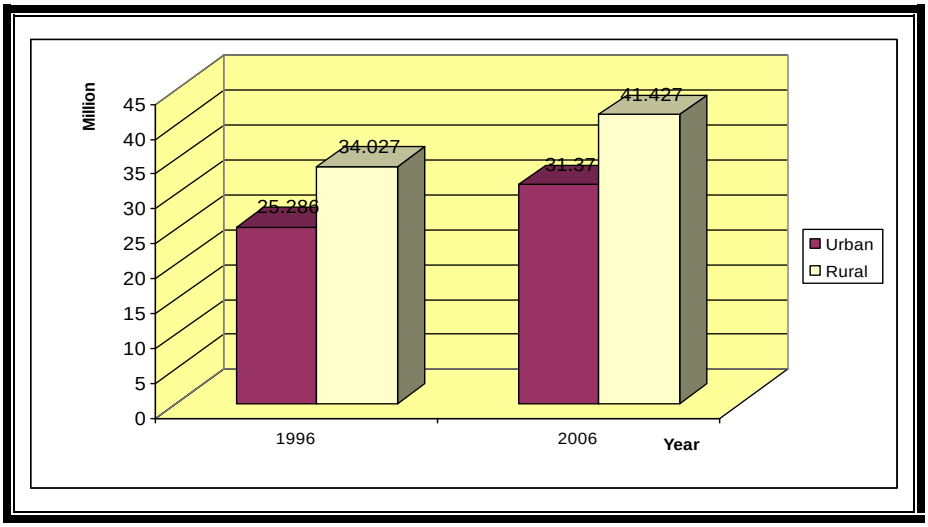
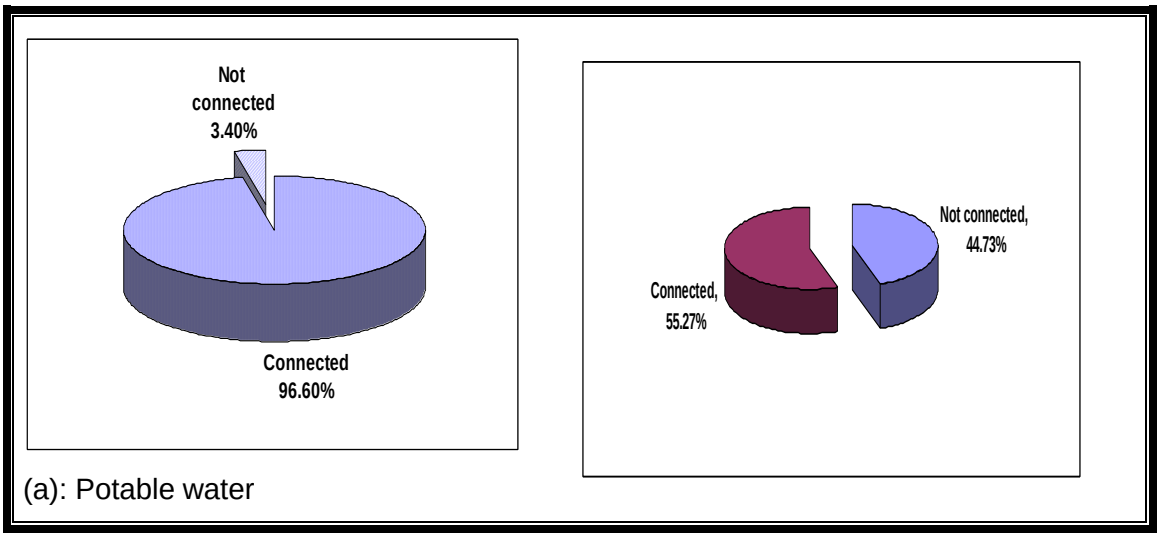


Figure 1: Urban and rural population of Egypt, 1996 and 2006
Source: CAPMS, 2007

The urban/rural distribution of the population of Egypt, in percentage terms is as follow, the urban population accounted for 42.63% and 43.09% of total population in 1996 and 2006, respectively. The percentage of rural population amounted to 56.37% and 56.91% in 1996 and 2006, respectively. This shows that this relative distribution has not change much between 1996 and 2006, which does not reflect the significant increase in population size, experienced in rural and urban areas, as shown in Figure 1.

According to this plan, the government invited the participation of the private sector in the operation, maintenance, replacement of plants and networks in different provinces, and connecting houses with networks. The government's plan is to enhance the role of the private sector in developing this field[22].



(a): Potable water

[22] Ministry of investment, Egyptian investment portal http://www.investment.gov.eg/MOI_Portal/en-GB/Egypts+Business/Egypts+Advantage/Location/A+developed+Infrastructure/Potable+water+and+sanitation+strategy.htm

(b): Sewage

Figure 2: Provision of potable water and sewage services in Egypt (% of HH)
Source: CAPMS, 2007

2.2. Development of drinking water sector in Egypt

While the Government of Egypt has made great development in extending Water and Wastewater services throughout the country, sector wide problems continued. Potable water and wastewater sector suffered, before reforms in 2004, from a long list of problems that affected its performance including institutional, technical and financial problems[23]. From the institutional side, the potable water and wastewater sector was supervised by as much as ten ministries and governmental agencies:

- Ministry of Housing Public Utilities and Urban Communities
- Ministry of Finance
- Ministry of Planning
- Ministry of Health
- National Investment Bank
- Ministry of Environment Ministry of Local Administration
- Ministry of Water Resource & Irrigation
- National Organization for Potable Water and Sanitary Drainage
- Central Agency for Organization & Administration
- Central Agency for Accounts
- Others

Furthermore, the sector was managed as a governmental body, meaning widespread bureaucracy, inefficiency coupled with absence of performance evaluation systems, dependence on government subsidies and over-staffing.

On the technical side, the potable water and wastewater sector experienced a number of problems including absence of O&M planning as well as inability to meet increasing requirement of service demands. Moreover, there were lack of adequate database and inaccurate and insufficient domestic meters.

Financially, the accumulated operating deficits reached $1 billion and thus the sector required continued subsidies. Additionally, debts accumulated debt to National Investment Bank exceeded $ 1.5 billion. The low tariffs and inefficient billing and collection systems coupled with

1.1.1 [23] A presentation made by the Holding Company at the First "Euro-Mediterranean Regional Programme for Local Water Management" water partners conference, held on 15-16 April 2007 - Amman, Jordan http://www.medawater-rmsu.org/meetings/1st_MWP_conference_2.htm

inability to achieve operating efficiencies to reduce costs proved to be a serious problem that need considerable restructuring of the sector[24].

Accordingly, it was decided at the beginning of the new millennium that sector reforms were necessary in order to over come these problems and to be able to provide good service to the country and citizens. Thus, a Presidential Decree no. 135 for 2004 was issued establishing the Holding Company and its subsidiaries, while the Presidential Decree no. 36 for 2004 established the Water Regulatory Agency.

Under the old regime, the sector was fragmented, which led to some sort of inefficiencies and overlaps. This contributed largely to increase exclusion of certain groups such as those living in illegal settlements. In an attempt to address these deficiencies, the Holding Company for Water and Wastewater was assigned the responsibility to purify, distillate, transport, distribute and sell drinking water in addition to collecting, treating and safe drainage of wastewater. The National Organisation for Potable Water &Sanitary Drainage was meanwhile responsible for the investments of all water and wastewater sector to all the governorates except Cairo & Alexandria. The Cairo and Alexandria Potable Water Organization were assigned the responsibility for the investments of water and wastewater sector in Greater Cairo region and Alexandria governorate, respectively. Furthermore, the Egyptian Water Regulatory Agency is responsible for supervising, reviewing and monitoring all water and wastewater sector activities[25]. The current system, however, represents a shift towards more centralization, which contradicting decentralization of local services provision and thus reduces to some extent the potentials for local participation.

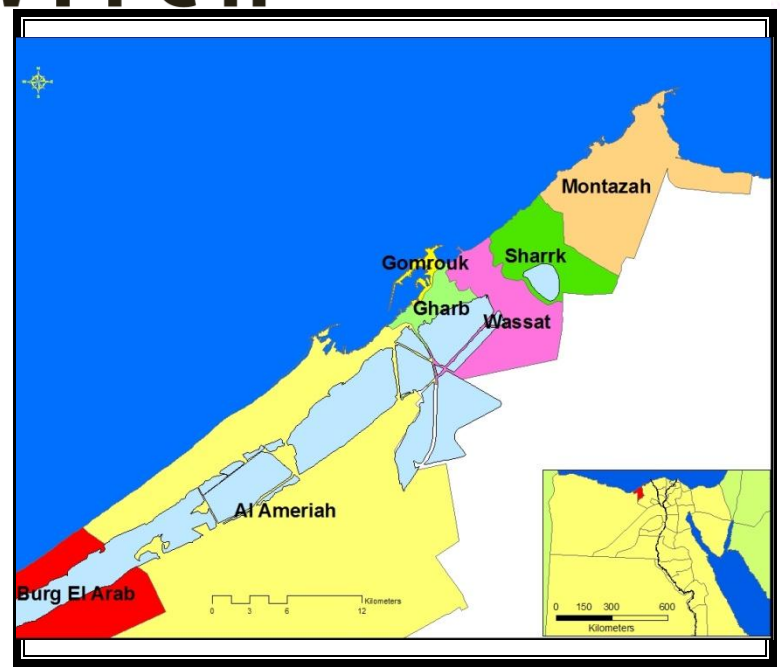
3. Alexandria

3.1. City context

Alexandria is one of the oldest cities in the world. The city, with its almost 4 million inhabitants, is located on the north western border of the Nile Delta. The governorate extends all along a coastal line of about 70 km[26] (See Map 1).

Alexandria governorate covers a total area of about 2818.8 km^2, divided into six administrative districts (neighbourhoods or *{Hai}*), beside Borg Al Arab district *{Markaz}* and city. The neighbourhoods are: Wasat , Gharb, Shark, Al Gomrok, Al Montazah and Al Ameriah. Some of these neighbourhoods (Al Montazah, Shark, Wasat and Al Ameriah) have rural background. In addition, it contains three rural localities dependent of Borg Al Arab district (Bheig, Abo Seer and Al Gharbaniyat), of which three villages and 30 hamlets *{Kafr}* and farms *{Ezbah}* are dependent. They are not considered satellite villages, hamlets or farms as administrative units, but rather rural communities dependent of urban divisions from the administrative and statistical points of view[27] (Map 2).

[24] Op. Cit.
[25] Op. Cit.
[26] Alexandria Governorate, June 2007, Alexandria Development project, integrated environmental and social impact assessment, Executive summary, Alexandria Governorate, Alexandria.
[27] UNDP, Alexandria Human Development Report, UNDP, New York, 2003



Map (2): Administrative subdivision of Alexandria

The inhibited area of the governorate covers an area of about 307 km^2, representing about 11% of the total area of the governorate. The total population of Alexandria reached by 2006 about 4.11 million people, giving an average population density of about 11,132 person/km^2. During summer time, an additional two million people come to Alexandria as a summer resort, which means 50% increase in the population of the city during summer time. Such seasonal increase in population has more impacts on water and sanitation companies rather than the quality of the services. Water and sanitation companies knowing about this pattern take special measures during summer season to ensure the same quality of services is provided around the year. For instance, operational capacity of water pumping stations as well as the sanitation treatment stations.

The spatial variations in population density between different districts are quite evident with the central old section of the city, Wassat district had an average of 133,460 person/km^2.The governorate is longitudinal in shape, extending from east to west for a length of about 60 km, and lies between the Mediterranean sea to the north and Maryuit lake and agricultural land to the south and south-east (Map 2).

The governorate has been experiencing rapid rates of population increase over the past three decades. For instance, the total population of Alexandria reached in 2006 about 4.110 million people compared with 3.339, 2.927 and 2.318 millions in 1996, 1986 and 1976, respectively (Figure 3).

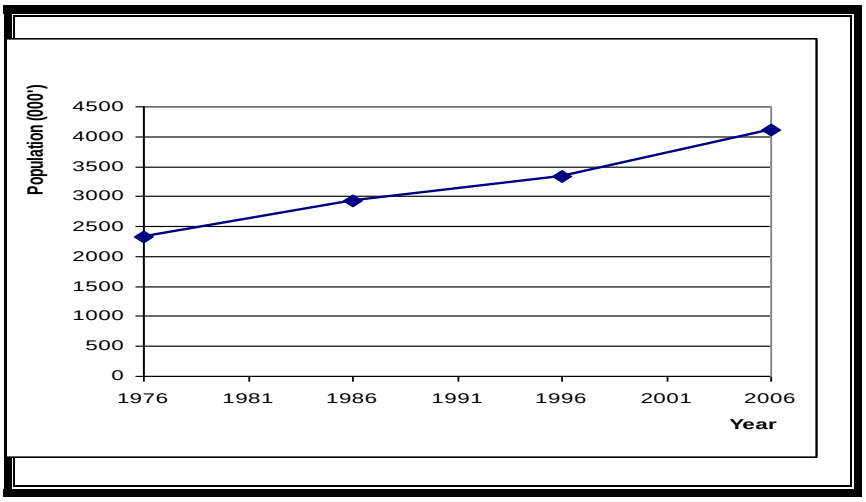


Figure 3: Population of Alexandria, 1976-2006
Source: CAPAMS, various censuses

This meant an absolute increase of about 1.972 millions, or 77%, over the past three decades. The spatial distribution of the population was found to be rather uneven between different districts of Alexandria, with the inner district, Wassat, reaching its saturation level and becoming pushing area of population. For instance, the spatial variations in population density between different districts are quite evident with the central old section of the city, Wassat district had, in 1996, an average of 133,460 person/km^2 [28].

The more peripheral districts, such as Montazah, Sharrk and Ameryiah districts are acting more as pulling areas of those moving out from the former district. The remaining two districts; Gomoruk and Garb have more or less stable population (Figure 4). For instance, the population of Montazah, Sharrk and Ameriyah districts have, between 1976 and 2005, accounted for 219%, 186.6% and 470% of their 1976 population, respectively[29]. These peripheral districts are the ones having the largest number and sizes of informal areas, which are mostly served with water connections. However, sanitation work, compared to water connections, lags behind in some of these areas. This has led residents in these areas to employ septic tanks to dispose of domestic wastewater.

[28] Soliman, A., April 1996, Legitimizing informal housing: Accommodating low-income groups in Alexandria, Egypt, Environment and Urbanization, Vol. 8, no.1, pp. 183-194.

[29] CAPMS, 2007, 2006 Census: Alexandria Governorate Results, CAPMS, Cairo.

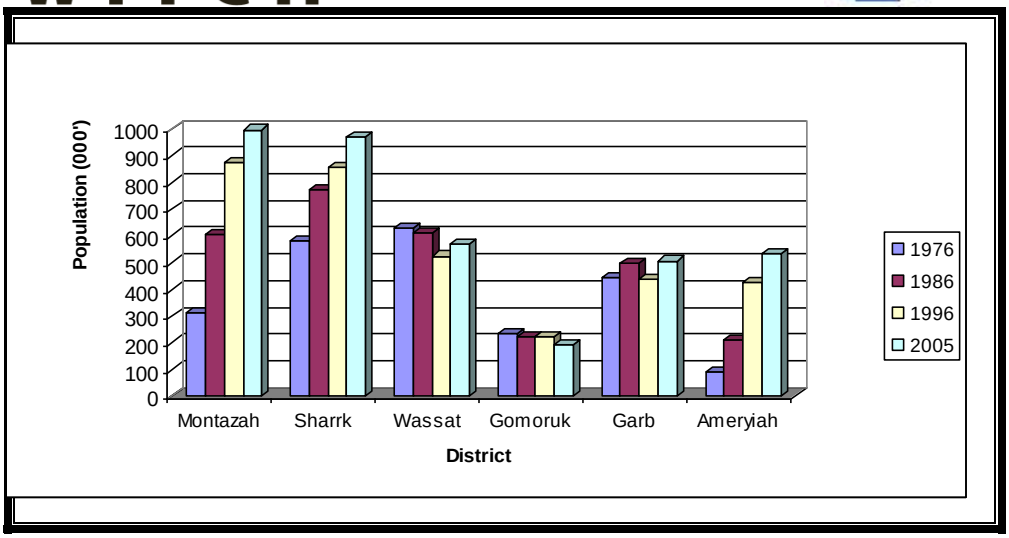


Figure 4: Alexandria population 1976-2005, by district
Source: CAPMS, various censuses and Alexandria Governorate, 2006

One fifth of Alexandria's population live in rural areas. These areas have a rural and Bedouin societal structure which contributes to the large rural life style in El Ameryiah, Sharrk, Wassat, El Montazah and Borg El Arab districts.

By 1996, there were about 36 informal areas, covering a total area of about 34.11 km^2. Such areas were occupied by about 848062 persons, representing about one-quarter of the total population of Alexandria governorate. This high concentration of population has led to an overall population density of about 24864 person/ km^2 [30].

By 2005 there have been about 50 informal areas in Alexandria covering an area of 7830.3 acres, accounting for about 9.7% of the total area of Alexandria governorate (Table 1). These areas accommodate as much as 1.4 million inhabitants, representing 41.8% of the governorate total population. Such informality could limit the chances of residents in obtaining basic infrastructure and services as well as collateral loans on their properties to improve their livelihood. It was suggested accordingly that prohibitions of informal areas development on agricultural land did not work, which meant that current trends would continue as long as alternatives are not offered to informal land and housing markets[31].

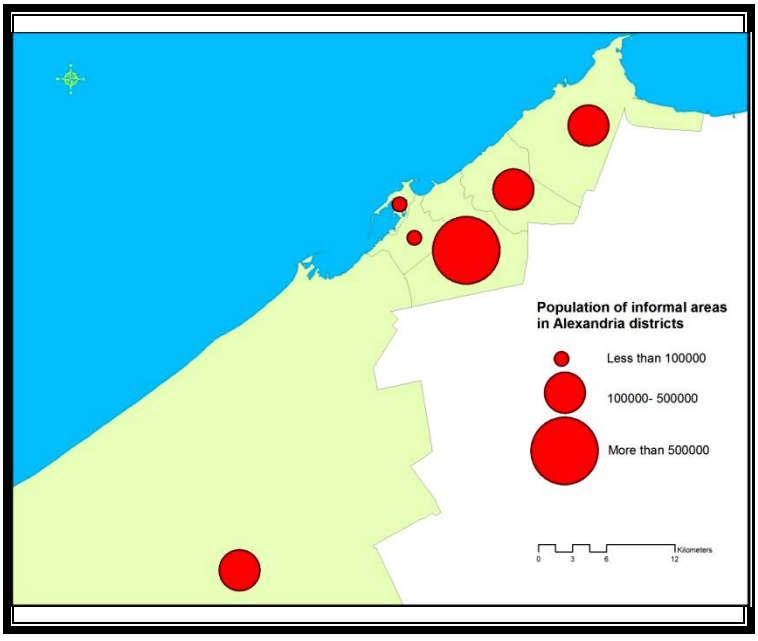
[30] The highest concentration of such areas, at district level, was found in Montazah and Ameryiah districts. These two districts accounted, alone, for 73% of the total population in such unplanned areas.

[31] GTZ, 2004, New practice of participatory local development in Egypt's urban areas, Policy paper, GTZ, Cairo

Table 1: Informal areas in Alexandria at district level, by number, area and population in 2005

District	Informal areas			District population	Built-up area (acre)	Population density (person/acre)
	Number	Area (Acres)	Population			
Montazah	8	935	295000	710000	9566.7	74.2
Sharrk	18	2926	268000	897000	1866.7	480.5
Wassat	8	64.6	535000	714000	1882.1	379.4
Gomrouk	0	-	-	236000	706.2	334.2
Gharb	8	44.8	61500	579000	2033.9	284.7
Ameryiah & Burg El-Arab	8	3859.9	285000	450000	64675.6	6.95
Total/ Average	50	7830.3	1444500	3613000	80731.2	44.8

Sources: General Administration of Planning and Monitoring, Alexandria Governorate (unpublished data), 2005



Map 3: Population size of informal areas in various districts of Alexandria

Map 4: Total area of informal areas in various districts of Alexandria

Such informal areas are associated with diverse negative effects on various aspects of the urban environment. For instance, in a study to assess the impact of these informal areas on the natural resource base of Alexandria governorate, it was found that urban encroachment in Montazah and Sharrk districts has led, between 1961 and 1995, to depletion of 15810 acres, representing 50% of original agricultural land in 1961. The total present value of foregone output, from all lost agricultural land, over this period, was found to be about L.E.1202 million[4]. Furthermore, it was suggested that this trend is expected to accelerate as land becomes scarcer and competition between various uses increases. This is especially true with more remote areas becoming more accessible. It can be argued consequently that the remaining agricultural land could be expected to be depleted by around 2015[32].

Concerning the actions taken by the government to deal with these informal areas and their impacts on these areas in terms of controlling the problem at governorate and improving living conditions; i.e. economic social and environmental, at the inner levels. Over the period 1993 and 2003, it was found, that the government has allocated a total sum of L.E. 275.5 millions to informal areas upgrading schemes in Alexandria governorate, with an average annual sum of about L.E. 27.5 millions. It was found that half these sums were spent on the provision of sewerage in these areas. Of the remaining sums 21%, 17% and 14% were allocated to electricity and street lighting provision, upgrading and extending potable water networks and road pavement, respectively (Abdrabo and Hassaan, in press).

[32] Abdrabo, M.A. and M. Hassaan, “Consequences of Urban Encroachment on Agricultural Land: Case Study Alexandria”, a paper presented at the International Conference on Environmental Development, Health and Sustainability, Alexandria, 22-25 March 1999.

3.2. Urban water management in Alexandria

3.2.1. Water supply

16.1.1.1.1 Alexandria water Company (AWCO) is the governmental agency that is responsible for providing potable water in Alexandria. AWCO is one of the oldest water companies in the Mediterranean as it was established in 1860. AWCO provides potable water for about 4 million of population. This number goes up to 6 million in the summer season. The main objectives of AWCO are to:

- *Upgrade customers' services.*
- *Maximize the benefits from human resources and improve staff capacity.*
- *Minimize the loss of potable water through the most advanced techniques in terms of network maintenance and replacement as well as efficient use of water.*
- *Adopt the most advanced technologies to achieve a standard performance at international level.*

Table 2: Potable water pricing in Alexandria

S	Type of use	Price		Sanitation charges (% of total bill)
		Quantity (m^3)	Prices L.E. /m^3	
1	Residential	0 – 10	0.23	35
		10 – 30	0.30	
		> 30	0.40	
2	Construction works		0.80	70
3	Religious buildings and social associations(*)		0.42	35
4	Sports club, syndications, political parties, and Embassies		0.15	35
5	Social clubs		1.00	70
6	Small industrial firms, workshops, hospitals, private schools, and bakeries		0.70	70
7	Large scale industrial firms in Burg El Arab		1.00	70
8	Large scale industrial firms in El Amriah and Alexandria		1.50	90
9	Petroleum industrial firms		3.50	70 (If any)
10	Private hospitals, five star hotels, and recreation area		1.15	90
11	Soft dinks firms	-	1.00	70 (If any)

(*) Religious buildings and social associations receive a discount of 50% on official rates

The company adopts the increasing block pricing system, for residential users, to allow for equity between users. However, the problem with the current system is that the company set a minimum charge of L.E. 3.00 monthly, which is the value of 10 m^3, even if there is no consumption[33]. Such arrangements do not provide incentives for water savings for low

[33] This figure was obtained from personal contacts with company officials.

consumption. Almost all parts of the city are served, with about 97.5% of Alexandria population (Figure 5 a).

In order to provide water connection to a house with the main network would cost about L.E. 3000, while acquiring a meter for a flat within a block of flats would cost about L.E. 600 minimum[34]. The company used to allow for the payment of this lump sum on instalments for the low income. This system was then abandoned. Furthermore, to get a connection, a person must have full ownership documents including building permits from responsible district. This means that due to the lack of ownership documents of the most residents of informal areas, they have a difficulty in ensuring water supply for their houses.

Water provision in Alexandria is subjected to various factors including the legality of the housing and/or land subdivision situation and the tendency of the government and the time of the decision-making process. For instance, the government in 1990s decided to provide the infrastructure and services to the residents of informal areas as a part of its upgrading program of such areas. In contrast, the governor of Alexandria later on made a decision not to permit new water connection for those living in informal areas who do not have legal connection. Such a decision affects those living in informal areas in general.

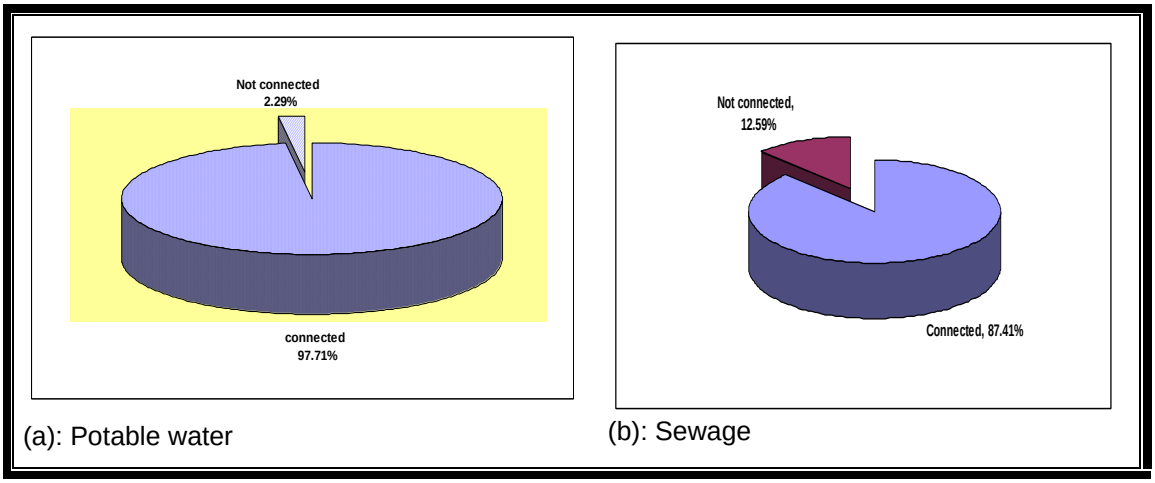
Another example of exclusion is the pooer even if ther ar living in forla housing units but cannot afford the relatively connection fees. In this case they are excluded based on financial grounds.

3.2.2. Sewage provision

Sewage connection provision is lagging behind potable water provision, especially in remote areas. However, the Sewage Company is, at present, aiming to reach 100% coverage in the coming few years. Furthermore, is already implementing plans to extend and upgrade its treatment plants to tertiary treatment, which is leading to considerable discussions on possible utilization of the treated wastewater (Figure 5 b).

It should be mentioned that there is significant disparity in terms of sewerage coverage, between large urban centers and the rest of teh country. In this context, the national average of sewerage coverage is quite low due to the lack of service coverage in most rural areas and small urban settlements. Therefore, such low national level doesn't reflect the situation of sewerage coverage in large urban areas. .

[34] These figures were obtained from personal contacts with company officials.



(a): Potable water (b): Sewage

Figure 5: Provision of potable water and sewage services in Alexandria (% of HH)
Source: CAPMS, 2008

In terms of the service quality, it was noted that sewerage flooding is becoming rare with the upgrading of the network with massive investments. Such flooding is mostly happening in low income areas.

3.2.3. Potentials for social inclusion in Alexandria

One of the issues of social inclusion in the context of Alexandria is full and effective participation by all stakeholders. Such participation need to be taken into account by involving some NGOs or more representatives of local councils in water management work and exercises. This would enable the voices of the residents in different sections of the city to be heard. It would also represent an opportunity for capacity building in the field of public participation and involvement in policy and decision making processes. Furthermore, there is the need to identify the best possible means for effective participation and involvement.

However, such an effective and full participation of all stakeholders in water management work and exercises has two sets of prerequisites. The first set belongs to the Alexandria Water Company, which despite its great efforts, the compay lacks to a clear-definedo communication strategy to communicate with different stakeholders. Meanwhile, the other set of these prerequisites is relevant to the residents, especially those living in informal areas, who have doubts about the real agenda behind such actions. This would consequently require water and sanitation bodies to work on developing a partnership and build trust with their various clients.

Meanwhile, the limited accessibility to information also represents an obstacle towards possible involvement of various parties. Therefore, there is an urgent need to provide data and information relevant to integrated water management and make such information available at various levels and different degrees of details and in formats understandable by different target groups.

4. Conclusion

Despite the importance of public participation and social inclusion in urban water management, they are not stated clearly in the objectives stated by the water company (see section 3.2.1 above). This is clearly obvious with the complicated system, and high fees, of acquiring new connections. The only exception, which was unfortunately abandoned, was the increasing blocks pricing. Thus, there is a need to integrate the issues, of social inclusion and participation, in various activities of the water and sewage companies.

There is also a need to develop a continuous dialogue between the companies and the end users to ensure participation and promote awareness on water conservation and environmental protection. Such a dialogue would also ensure efficient utilization of already massive government spending in this sector.

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