

**Improving Urban Water Quality for
Livelihoods Enhancement in the Odaw-
Korle River Catchment of Accra, Ghana**

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DECLARATION

I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarised the work of others.

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ABSTRACT

Water and environmental resources which provide opportunities for households are threatened by human activities that leads to pollution. The research objectives were to understand the contribution water makes to the livelihoods of urban and peri-urban households; the factors influencing perceptions, attitudes and behaviour in relation to surface water and environmental quality, and measures for promoting community participation in water and environmental management. Ten communities were selected in Accra and its surrounding communities to reflect different levels of infrastructure provision for the study. Four focus group discussions were held in each community, with a mixed group, men, women, and young adults. Issues which emerged were investigated further in a structured household questionnaire survey involving 443 respondents. Key informant interviews were held with the most important government and non government regulatory, research and service provision departments and organizations in water, sanitation, and the environment sectors. Water samples from some of the selected communities were analyzed in the laboratory to compare with respondents' perceptions. Among the households surveyed, 59.14% were engaged in a water dependent occupation which contributed over 80% of household income in some cases. The study also found that perceptions of water and environment are influenced by the existing social and cultural setting. There were common concepts which helped groups to interpret and make meaning from their environment. The prospects for successful water and environmental interventions can be enhanced through an understanding of this local knowledge and perceptions. There was no clear relationship between attitudes and environmental behaviour or between attitudes and socio-economic status. Actual behaviour was influenced by ability to pay for services, their availability and the influence of shared community norms. Although citizen participation in water and environmental management decision making is very limited at present, community collective action holds good prospects for future interventions in water and environmental management.

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LIST OF ABBREVIATIONS

AMA	Accra Metropolitan Assembly
ANOVA	Analysis of Variance
APHA	American Public Health Authority
AVRL	Aqua Vitens Rand Limited
AWEF	American Water Environment Federation
AWWA	American Water Works Association
BOD	Biological Oxygen Demand
CERSGIS	Centre for Remote Sensing and Geographic Information System
CONIWAS	Coalition of Non Governmental Organization in the Water Sector
CPRC	The Chronic Poverty Research Centre
DAC	Development Assistant Committee
DFID	Department for International Development
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
ESICOME	The Expanded Sanitary Inspection and Compliance Enforcement
EU	European Union
FGDs	Focus Group Discussion
GDP	Gross Domestic Product
GWCL	Ghana Water Company Limited
ICMSF	International Commission on Microbial Specification for Food
ICT	Information Communication Technology
IDS	Institute of Development Studies
ILO	International Labour Organisation

ISSER	Institute of Statistical, Social and Economic Planning
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KLERP	Korle Lagoon Ecological Restoration Project
KVIP	Kumasi Ventilated Improved Pit
L.I	Legislative Instrument
LUMP	Land Use Planning and Management Project
MDGs	Millennium Development Goals
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MONROE	Vietnamese Ministry of Natural Resources and Environment
MSP	Multistakeholder Process
MSW	Municipal Solid Waste
MWH	Ministry of Works and Housing
MWRWH	Ministry of Water Resources, Works and Housing
NESP	National Environmental Sanitation Policy
NDPC	National Development Planning Commission
NEPAD	New Partnership for Africa's Development
NSF	National Sector Framework
NWP	National Water Policy
OECD	Organization for Economic Cooperation and Development
PAH	Polyaromatic hydrocarbons
PCA	Principal Component Analysis
PHD	Public Health Department
PSD	Principles of Sustainable Development
PURC	Public Utilities Regulatory Commission

RCC	Regional Coordinating Council
RUAF-CFF	Resource Centre for Agriculture and Food Security - Cities Farming for the Future
SES	Socio-Economic Status
SLA	Sustainable Livelihoods Approach
SLF	Sustainable Livelihoods Framework
SPPI	Strategic Programme Planning and Implementation
SWITCH	Sustainable Water Management Improves Tomorrow's Cities Health
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TBL	Triple Bottom Line
TCPD	Town and Country Planning Department
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UN	United Nations
UNCHS	United Nations Centre for Human Settlement
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UPA	Urban and Peri urban Agriculture
WD	Water Directorate
WHO	World Health Organisation
WMD	Waste Management Department
WMO	World Meteorological Organization
WRC	Water Resources Commission
WRI	Water Research Institute

CHAPTER ONE : INTRODUCTION

This chapter presents the context, the definition of the problem, the goal, the objectives, and the rationale of the research. This is followed with a brief introduction on Ghana and Accra setting out the background for the study in a developing country context. The justification for the study is grounded in the relevance of the findings for support to social and economic activities and environmental quality in Accra, options for interventions by key organizations and prospective contributions to the existing body of knowledge on urban water and environmental management.

1.1. BACKGROUND AND CONTEXT OF THE STUDY

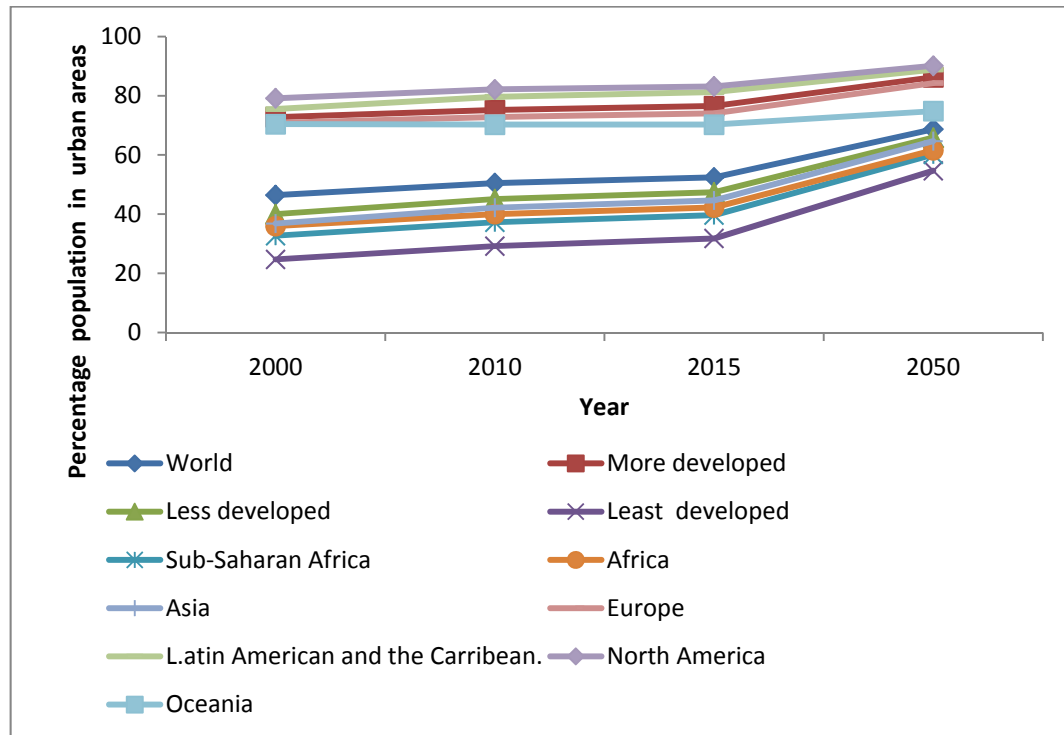
The process leading to the development and growth of towns and cities is urbanisation. During this process, there is movement of people from rural areas to towns and from towns to cities. The process leads to the development of economies and their political systems (UN-HABITAT and DFID, 2002). However, urbanization is a challenge worldwide, but especially in the developing countries which are experiencing the fastest rates of urban growth. The global proportion of urban population will increase from 50.46% (3.5 billion approximately) in 2010 to 52.37% (3.8 billion approximately) in 2015 (that is an average annual addition of 60 million people). It is projected to reach up to 68.7% (6.3 billion approximately) in 2050 (that is an average annual addition of 62.5 million people) (Figure 1.1). In Africa, the proportion of urban population will increase from 39.98 % (413 million approximately) in 2010 to 42.2% (486.5 million) in 2015 (that is an annual average addition of 14.7 million people), reaching up to 61.59% (1.23 billion approximately) in 2050 (that is an average annual addition of 20.40 million people) (see Figure 1.1 below) (UN, 2009a and 2009b).

‘The sustained increase of the urban population combined with the pronounced deceleration of rural population growth will result in continued urbanization, that is, in increasing proportions of the population living in urban areas’ (UN, 2009b:2).

The above figures paint a picture of urbanisation continuing to have a major impact on developing nations. The challenges of urbanization will thus be greatest for countries least able to cope with it. Urbanization is a response to economic, social and political forces, but the specific ways in which urban areas and cities grow in different countries, change under the influence of new factors. This implies that a reduction in formal economic fortunes for example can increase the number of people involved in the

informal economy. The consequences can include expansion in informal settlements. (Cities Farming for the Future, 2006).

Figure 1.1: Proportion of urban population by region



Data source: UN, 2009a

Many cities cannot cope with such massive population growth. City authorities around the world face enormous challenges in creating sufficient employment, in providing basic services such as drinking water, sanitation, basic health services, housing, and education, in planning and maintaining green spaces, in managing urban wastes and wastewater and in decentralization and creation of efficient local autonomy (Cities Farming for the Future, 2006; UN, 2009b).

At the current rate of progress, the world is expected to miss the Millennium Development Goal target of halving the proportion of people without access to basic sanitation by 2015 (UNDP, 2010). In 2008, an estimated 2.6 billion people around the world lacked access to an improved sanitation facility. If the trend continues, that number will grow to 2.7 billion by 2015. In 2008, 48% of the population in developing regions was without basic sanitation. The two regions facing the greatest challenges with sanitation are sub-Saharan Africa and Southern Asia, where 69% and 64% of the population, respectively, lacked access (UNDP, 2010).

In addition, environmental degradation and water pollution are reducing the natural resource base that many economies rely on. Marine and coastal ecosystems are threatened in Latin America and the Caribbean, Southeast Asia, and Oceania (UN Millennium Project, 2005).

Another negative impact of urbanisation is that poverty levels may rise. Key poverty-environment linkages in urbanization are evident in the areas of health, occupations, and vulnerability. The impacts of such health service inefficiencies contribute significantly to the disease burden of the poor, particularly of women and children. The population density (and poor layout) of low-income areas, especially informal settlements and slums, worsens the situation, creating conditions in which infectious and parasitic diseases spread more readily (UN-HABITAT and DFID, 2002; UN, 2009b).

However, urbanisation comes with both good prospects and problems. As the populations of towns and cities rise, several problems confront them. Among the challenges of urbanisation, water supply and sanitation, as mentioned above, are critical because they are basic for human survival. In addition, water and environmental resources which create opportunities for the pursuit of livelihoods by the urban and peri-urban population are threatened by pollution. Water in the city constitutes an important input into people's occupations, especially the urban poor, who will often put in extra effort to access water (Abraham *et al.*, 2007). In addition to the primary functions of drinking, bathing, washing, cooking and cleaning, water is also used for several small-scale income generating activities such as crop cultivation, food preparation and vending, car washing, construction and livestock keeping. A good understanding of the causes of pollution and the potential benefits of water resource related livelihoods will help chart a course on how they might be protected to serve multiple uses.

The example of Accra, Ghana (Figure 1.2), illustrates the range and importance of water dependent livelihoods. Water dependent occupations such as urban farming, floriculture, car washing and food vending, contribute significantly to the livelihoods of urban households in Accra. For some individuals in Accra, most (over 80%) of their income is generated from these occupations (Abraham *et al.*, 2007). However, the extent to which these urban water-dependent occupations contribute to the livelihoods of poor people of Accra has not been quantified adequately, making it difficult for city authorities to appreciate this contribution. Consequently, urban water supply managers

rarely include the use of these water sources [treated water and surface water] for various occupations in their planning.

Figure 1.2: Map of Ghana



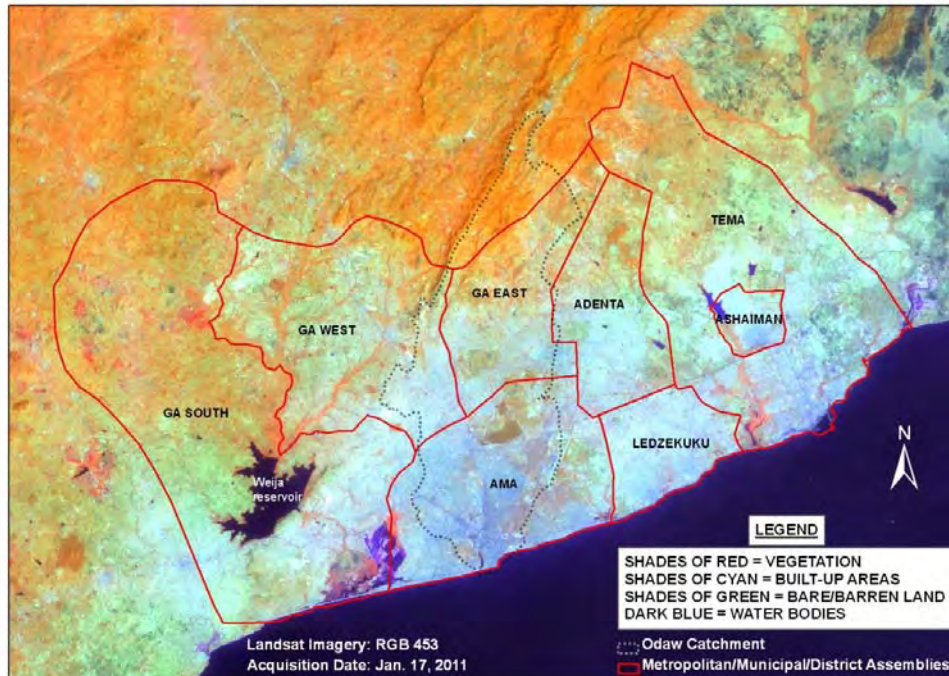
Source: ghanaweb.com

Furthermore, the use of surface water resources such as, streams, rivers, lakes, ponds, and harvested storm water among others, is determined by the water quality. In Ghana, surface and ground water pollution are high near human settlements, industrial (including mining) estates and agricultural undertakings (Akufo, 1998; MWH, 1998; JICA, 1999). Unauthorised disposal of solid and liquid waste into water bodies in Ghana is a common problem, resulting in water pollution, notably in Accra's Odaw River and Korle Lagoon (Figure 1.3) which is currently (2011) in the final phase of an ecological restoration process.

Previous studies on the quality of urban surface water in Accra show that many sources are polluted (Obuobie *et al.*, 2006; Amoah *et al.*, 2005; Boadi and Kuitunen, 2002; Ansa-Asare, 2001; Ansa-Asare, 2000). The pollution of surface water limits its use for domestic and productive activities, especially those for which good water quality is essential; for example, the use of polluted water for crop production contaminates harvested crops (Amoah *et al.*, 2005). Therefore measures that will enhance surface water quality for multiple uses will be of great benefit. Thus, a holistic approach which

embraces these different dimensions is required to study the water and environment interaction within the Odaw-Korle River catchment.

Figure 1.3: Map of Accra and the Odaw-Korle River Catchment



AMA: Accra Metropolitan Assembly

Credit: Gerald Forkuor, IWMI, Ghana, 2011

Note: Accra and the surrounding districts used to be referred to as Greater Accra Metropolitan Area [GAMA], until the new districts (Ga South, Ga West, Ga East, Adenta, Tema, Ashaiman, and Ledzekuku) were created out of it.

The Odaw-Korle River catchment is estimated to drain about 60% of the city of Accra (Boadi and Kuitunen, 2002). The catchment is unique, having a gradual ecological transition from the head of the Odaw River to the Atlantic coastal zone. Different ecosystems, including freshwater streams, a lagoon and a coastal zone are related to the transition from rural, peri-urban to urban environments. The Odaw River and Korle Lagoon are threatened by pollution inflow from Accra where less than 10% of the wastewater enters a sewer and many residents dispose of solid waste at unauthorised locations (Obuobie *et al.*, 2006).

Previous studies (Biney, 1998; Armar-Klemsu *et al.*, 1998; Sonou, 2001; Zakariah *et al.*, 1998; Amoah *et al.*, 2005, 2006) carried out in the catchment, have focused mostly on the bio-physical component of surface water pollution. Therefore, there is limited

understanding of the productive use of the water body, the pollution of surface water resulting from environmental practices and behaviour and the response of relevant organizations to these problems.

The research presented here, investigated different uses of water in a range of livelihoods. It investigated further the factors influencing perceptions, attitudes, and behaviour. It also explored the organizational roles and interventions [mandates and programmes in place] in response to problems of access to treated water and surface water (rivers and streams) and environmental pollution. The analysis was also intended to deepen knowledge on urban water and environmental management. This is important for prioritizing and financing interventions in the catchment, since municipal resources are limited. The analysis aimed to identify the key causes of water and environmental pollution, community actions, and organizational interventions relevant to addressing the problem of urban water and environmental pollution. This will support an integrated urban water management approach that will ensure that urban dwellers, especially the low income group, have access to improved water quality for domestic and productive use and a clean and healthy environment. To let this happen, it is important that the problems and research objectives and questions are clearly defined.

1.2. STATEMENT OF THE PROBLEM

Many people in urban areas are engaged in productive water dependent activities. Consequently, limitations on access to water for various uses will result in a reduction in jobs, essential services and household income with a possible increase in poverty levels. In the past, surface water resources in Accra supported different occupations such as fisheries, aquaculture, urban agriculture, as well as some domestic activities including bathing, washing, and some household chores. Today, only specific sections of Accra's surface waters support a limited number of these activities with losses in potential income.

The reduced quality of the water is attributed to multiple factors such as organizational lapses, including lack of enforcement of regulations and human behaviour and practices within the catchment. This is a challenge because wastes [solid and liquid] are discharged into surface water bodies and the environment. Furthermore, treated and surface water management processes do not include adequately the social and economic considerations of water utilization, especially for productive activities by households.

This is partly because the human aspect within this interrelationship has not been an area of much research, whereas more work has been carried out on the technical components. Key urban water and environmental management organizations have not collaborated adequately and therefore have not been able to respond appropriately to the challenges in the urban water and environment sectors. Consequently, urban water users are denied the space and opportunity to present their concerns and the problems they face.

1.3. RESEARCH OBJECTIVES

This section presents the objectives and the research questions which form the basis upon which the study was carried out. The aim of the study was to understand the contribution water makes to livelihoods of urban and peri-urban households; the factors influencing perceptions, attitudes and behaviour in relation to surface water and the environment, and to identify measures for promoting community participation in water and environmental management.

1.3.1. Objective 1

To investigate access to and uses of water and their effects on households including income and well-being.

In analysing the factors influencing access to and use of water in the communities, it is important to understand the existing practices. Consequently, specific conditions and strategies relating to access and use of water for both domestic and productive activities were investigated both at the household and community level. Cost elements in access to water had to be investigated to improve the understanding of the situation. Exploring gender roles was also important for understanding household processes. Understanding investments in water occupations and their importance to households' income was intended to generate relevant knowledge which could lead to recommendations for improving water and livelihoods. To locate the analysis within the appropriate context, the study also investigated the asset status of households; and the existing social relationships or networks and how they influence the different occupations and well-being of community dwellers. The communities' constructs of poverty were also important for placing well-being in context.

1.3.2. Objective 2

To investigate perceptions, attitudes, and behaviour which affect the quality of surface water and the environment.

Access to surface water of safe quality implies possible uses for activities such as urban farming and domestic activities which could contribute to the overall benefits from water use. To respond to this objective, it was important to develop understanding of people's constructs of the concept of quality relating to water and the environment and its influence on water use.

The study also examined the motivations and controls affecting people's behaviour towards water and the environment. The attitudes of people towards water and the environment were also investigated. It was also important to relate people's behaviour and attitudes to existing sanitation and solid waste practices within the communities. The study recognised that solutions to the existing water and environmental problems can benefit from the communities' perspectives and therefore set out to explore community-driven initiatives to water and environmental problems, especially how communities could be encouraged to develop and maintain these initiatives.

1.3.3. Objective 3

To investigate how organizations can promote community participation in urban water and environmental management.

The organizational and institutional context of the water and environmental sectors shapes the use of water and influences attitudes and behaviour in relation to surface water and the environment. The organizations are governmental or non-governmental and play different roles. The communities may also have their own systems and expectations for water and environmental management. Empowering these communities can enable community participation. Understanding the different roles of the communities and organisations in the water and the environment sectors could create a good platform upon which recommendations emerging from objectives one and two could be implemented. To achieve this, the study analyzed selected key organizations in the water and environmental management sectors to understand how their mandates and programmes contribute to urban water and environmental management. This was to help assess the prospects of integrated urban water management.

The three objectives above led to three key research questions and related supplementary questions presented below.

1.3.4. Research Question 1:

How does access to water for domestic and productive uses affect households and their well-being?

- i. What factors influence access to water by households? How is water use affecting households, including income from water dependent occupations?
- ii. What is the assets status of households?
- iii. What are the existing social relationships or networks and how do they influence households and occupations?
- iv. What are the community perceptions of wealth and poverty? Do they encompass access to water?

Research question one responds to objective one. The key question and the sub-questions were formulated to allow an understanding of how households were accessing water and the factors influencing it; who was accessing what and at what cost; the concerns over quality, and household responsibilities in managing domestic water. It allowed understanding of water supply and access at the city, community and household level. The questions also allowed understanding of different uses of water for domestic and commercial activities and in the case of commercial activities, the income flow to households and how it supports livelihoods. The study was carried out within the scope of investigating households' assets status. It allowed understanding of the relationships between occupational choices and social factors such as wealth and poverty which has a bearing on perceptions of well-being. These dimensions are particularly important for interventions.

1.3.5. Research Question 2:

Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced?

- i. What are the community criteria for and perception of surface [river] water quality and to what extent do these influence its use for various activities?

- ii. What is the state of sanitation and solid waste disposal and management practices, and how do they influence people's perception, attitudes, and behaviour to water and environmental quality?
- iii. Does household assets' status, including income, influence attitudes to surface water and environmental quality?
- iv. In the light of i, ii and iii, how can perceptions, attitudes and behaviour to surface water and environment be influenced by community and city initiatives?

Research question two responds to objective two. People perceive water quality based on several factors and this influences attitudes and behaviour to water and the environment. Therefore, these questions were directed towards enabling investigation into what informed people's perceptions about water and the environmental quality. The type of sanitation and solid waste collection systems, their cost implications and how that was contributing to the pollution problem had to be understood. Since respondents came from different socio-economic backgrounds, it was important to understand whether there was any relationship between specific attitudes and selected socio-economic factors. A sound understanding of these factors allows for designing interventions to respond to specific behaviour and practices which pollute surface water and the environment. It was expected that the analysis of the results would generate knowledge for responding to current challenges in the water and the environment sectors and also for pre-emptive actions on possible challenges.

1.3.6. Research Question 3:

How can organizations promote community participation in urban water and environmental management?

- i. What are the strengths, weaknesses, opportunities and threats of the selected key organisations in urban water and environmental management?
- ii. How can organisations promote community efforts towards urban water and environmental management in support of livelihoods?
- iii. In the light of the results from the study, what are the prospects for integrated urban water and environmental management?

Research question three responds to objective three. As different organisations are involved in the water and the environment sectors and it was important that key ones were studied to generate the relevant knowledge needed by these organisations and other stakeholders for their decision making. The key question and the sub-questions were particularly important because they allowed for a systematic study of the selected organisations in order to identify what they could do differently to address the current problems in the water and the environment sectors (explored through questions one and two). Different communities also have strengths and in particular, local knowledge, which could contribute to responding to the diverse challenges. This question also helped to investigate what the communities had to offer in terms of responding to water and environmental problems in relation to roles of water and environmental organisations. The research objectives and the questions have their bases in the rationale for the study.

1.4. RATIONALE FOR THE STUDY

Although urbanization in poor countries is a source of problems, it also creates an opportunity. High population density can allow critical social services such as education and health care to be extended more than in the rural areas, although these services often remain inaccessible to many urban poor. Urban communities also have access to different occupational choices which may be absent from the rural areas (UN Millennium Project, 2005).

Therefore cities are important places for planning of strategies and interventions that can help reduce poverty and hunger and improve local economic development (Cities Farming for the Future, 2006). In response to this global challenge of urbanization, as discussed above, an EU funded project, SWITCH, (Sustainable Water Management Improves Tomorrow Cities Health) was launched in 2005. The overall goal of SWITCH was identifying new solutions to improve the efficiency of urban water systems through a paradigm shift toward integrated urban water and environmental management (<http://www.switchurbanwater.eu/about.php>). The research presented here has been carried out within the framework of the SWITCH project.

The above considerations therefore set the context and the need for this research. Innovative solutions are urgently needed to respond to the current and emerging

problems as outlined above. Thus, the study was expected to contribute towards the development of innovative solutions to respond to these problems.

The conditions in Accra are comparable to those found in other cities in the developing world. These include a high urbanization rate [3.4% per annum], degradation of urban water resources, problems with waste management practices, environmental quality, and poor access to potable water and sanitation. A brief description of some characteristics of Ghana and Accra is presented below.

1.4.1. Selected physical and socio-economic characteristics of Ghana

Ghana lies at the shore of the Gulf of Guinea in West Africa (Figure 1.2) and occupies a total area of about 24 million hectares (ha) (240,000km²). To the North, it borders Burkina Faso, Togo to the East and Cote D'Ivoire to the West. The country is divided into ten administrative regions and six ecological zones dominated by semi-deciduous forest and Guinea Savannah. Rainfall ranges between 600mm/year in the coastal zone to 2200 mm/year in the south western rainforests. About 64% of Ghana's surface falls within the Volta basin (Obuobie *et al.*, 2006; Dickson and Benneh, 1995).

The 2010 projected population of Ghana stood at 24, 432,000, with an annual urban growth rate of 3.18% (UN, 2011). This is high compared to the 2010 world annual urban growth rate of 1.91% (UN, 2011). Households in Ghana are still traditional in structure (in terms of the members such as mother, father, children, nephews, nieces, grandparents, in-laws, brothers and sisters). This composition is changing though because of urbanisation. In the year 2000, only 53.3% of the population (15 years and older) were literate in either English or a Ghanaian language (34. 2 % were literate in both) (Ghana Statistical Service, 2002).

In Ghana, the four major occupations are agriculture and related work (49.2%), production and transport equipment work (15.6%), sales work (14.2%) and professional and technical work (8.9%) (Ghana Statistical Service, 2002). Agriculture, a major component of the Ghanaian economy contributed to 36% of GDP and employed 60% of Ghana's labour force (ISSER, 2002).

In the year 2000, the Ghana Statistical Services Department (2002) estimated that countrywide, approximately 42% of households had access to pipe borne water or a

tanker service, while 33% used a well or a borehole. The other 25% of households relied on natural water sources including rain water, river and pond.

Furthermore, 41.5% of households had a toilet in, or adjacent to the house, and in most cases, toilets were shared with other households. In terms of the type of toilet, the pit latrine served 22% of households while the water closet served 8.5%; the KVIP (Kumasi Ventilated Improved Pit), served 6.9%; and the bucket/pan served 4.1% of households. For the rest of the households, 31.4% used a public toilet facility, while 20.2% had no access to any specified facility (Ghana Statistical Service, 2002). In the year 2000, average household size was 5.1.

In Ghana, a small proportion (up to 10%) of the wastewater is treated and less than 5% of the population has sewerage connections. Most domestic grey water flows into storm water channels or streams and finally into the ocean. The use of the urban water sources in urban livelihoods is thus constrained, such that urban and peri-urban farmers and other users in need of safe irrigation water find none that is unpolluted (Obuobie *et al.*, 2006).

1.4.2. Accra

Accra is the capital city of Ghana and covers an area of about 230 to 240 km² (Figure 1.3). It had an estimated population of 1.66 million in 2000 (Ghana Statistical Service, 2002). It is also the capital of the Greater Accra Region (one of ten regional or administrative divisions of Ghana). The most recent population estimate for 2009 stood at 2,269,000 (UN, 2011). In 2011, this is expected to be higher (however, there is no known recent figure). Economic growth in Accra has been the reason for high immigration (Twum-Baah, 2002). Average household size in the year 2000 was 4.5 (Ghana Statistical Service, 2002).

About 60% of Accra's population lives in informal settlements or what will be described as low income settlements in the centre of the city, while the middle and upper income residential areas move to its periphery (Obuobie *et al.*, 2006).

In the year 2000, 43.6% of households accessed pipe borne (treated) water in their houses whereas 47.1% accessed pipe borne water outside their homes (usually from neighbours or water selling points in their communities). This implies that up to 90%

had access to a treated water source. The rest of the households accessed water from: water tanker operators (3.1%); well or bore hole (4.7%); natural sources (spring or rainwater and dugout) (1.25%); and other (0.31%) (Ghana Statistical Service, 2002).

The year 2000 census data shows 63% of the population in Accra had a toilet in or adjacent to the house. In terms of the type of toilet, the pit latrine served 6.0% while the water closet served 23.4%; the KVIP served 11.7%; and the bucket or pan served 12.7%. For the rest of the households, 32.7% relied on public toilets (of all types pit, water closet, KVIP, bucket); facilities in another residence served 9.3%; with 4.0% having no specified means of access to a toilet while 0.2% depended on other toilets (Ghana Statistical Service, 2002).

In terms of access to treated water, Accra was far ahead of the national proportion (42% had treated water). In terms of access to sanitation, Accra (63% had access to a form of toilet in or adjacent to the house) was ahead of the rest of the nation (41.5% had access to sanitation in or around the house). Compared with the national figures, a higher proportion in Accra also had access to a water closet, whereas access to public toilets was about the same according to the 2000 population and housing census. In terms of mean household size, Accra (4.5) was smaller than the national mean household size (5.1).

It should be noted that the city started phasing out the bucket latrine after the year 2000. Pit latrines are also difficult to maintain and are not popular with residents and therefore with time they also get phased out of the urban environment. With the increase in Accra's population, more and more people depend on public toilets. A recent survey (AMA, 2011) by the city authority indicated that the majority of households now depend on public toilets, since it was established that up to 91% of residences lacked in-house toilets (see chapter five, box 5.1) (see chapter two sections 2.3.1 and 2.4; chapter three section 3.3; for further information on Accra).

1.4.3. Expected contribution of the research

The study was intended to broaden the analysis of urban poverty to include assets ownership of households, such as financial, human, natural, physical, and social, and to identify options on measures to address it. Multiple uses of water could contribute to addressing aspects of the current water scarcity in cities today. Implementation of

pollution control measures could result in improvements in water and environmental quality over time.

In the context of the livelihoods framework [discussed in chapter two] and research question one, the study was expected to deepen knowledge on assets and their relationships with communities' constructs of wealth and poverty. It was to broaden the explanations for the social dimensions of people's occupational choices and the expected outcomes in an urban environment. This was intended to improve understanding on how specific interventions relating to water and livelihoods could be designed to improve people's lives (see section 1.3.4).

Access to good quality water means a probable improvement in quality of specific products, thus helping to maximize the benefits of the surface water use. Several activities [liquid and solid waste disposal practices of both domestic and industrial sources, farming activities, sand winning, among others] could affect the water quality within the Odaw-Korle catchment and it is important that the factors driving pollution are understood in order to support good water and environmental management. Thus mapping out the water quality situation of the Odaw-Korle catchment and the factors which influence it, will help the Accra Metropolitan Assembly to address water and environmental problems with appropriate organizational and human behavioural contributions (see sections 1.3.5 and 1.3.6).

The study also identified the present state of local leadership and knowledge (community participation) as well as measures (including organisational mandates) which can help the metropolitan authorities to design management strategies for the catchment (see section 1.3.6).

The study therefore aimed to understand;

- the contribution water makes to the livelihoods of households since this will enhance the integration of occupational concerns into urban water management.
- the factors influencing perceptions, attitudes, and behaviour relating to water and environment.
- how organisational and community participation can enhance access to water and address surface water and environmental pollution to ensure good water quality for occupations and environmental services.

This understanding will contribute to improving urban water and environmental management processes.

1.5. SUMMARY

In chapter one, an introduction to the problems to be investigated in this study was presented, including the linkage between loss of water use potential and possible loss of jobs that could lead to a rise in poverty levels since water dependent productive occupations tend to offer opportunities for low income households.

The global, regional and national extent of urbanization and the different dimensions and changing trends in urbanization were outlined. Urbanization comes with challenges over services and natural resources in the city. It threatens efficient distribution of potable water resources and therefore contributes to cases of ill-health from contaminated water. The rationale for the study was presented and it was argued that the consequences of urbanisation make it imperative to develop innovative water and environmental management. It was also indicated that the study will deepen knowledge for organizational and community management of water and the environment. The research builds on the existing body of knowledge in the field, presented in chapter two

1.6. THESIS STRUCTURE

The thesis is organized into seven chapters. This structure is guided by the three research questions. The first chapter introduces the study and sets out the aim, objectives and the research questions. It presents a rationale of the study. A review of the existing body of knowledge is presented in chapter 2, setting the context in terms of definitions, background literature and the conceptual framework which guided the design of the research and was a framework for analysis. The literature review provided understanding of the issues and helped to identify the gaps in knowledge which then led to the three research questions for the investigation. Chapter three describes the methods used to respond to the different research questions presented in chapters one and two and the actual setting where the study took place. The findings are presented in chapters four, five and six. Chapter four responds to research question 1. It presents the findings on households' access to and use of water, the benefits of water related income generating activities and the role of water in households' livelihood strategies. A qualitative analysis of perceptions of wealth and poverty and a computation of the

wealth status of the households are also presented. Chapter five responds to research question 2. It analyses people's perceptions, attitudes and behaviours to surface water and the environment and factors influencing them, leading to discussion of ideas for influencing attitudinal or behavioural change. Chapter 6 responds to research question 3. It discusses the strengths, weaknesses, opportunities and threats of the selected organizations involved in urban water and environmental management. Issues arising from the community interactions and the prospects of integrated urban water management are considered. Chapter seven consolidates the key findings and conclusions leading to a discussion on the study's limitations and future work.

CHAPTER TWO : LITERATURE REVIEW

The research set out to investigate people's water and livelihoods, perceptions, attitudes and behaviour, as well as the organisational and institutional components of water and environmental management. The application of the Sustainable Livelihoods Framework was considered appropriate to help to respond to the water and livelihoods component. The Sustainable Livelihoods Framework (SLF) is a tool for understanding livelihoods, particularly of the poor. Drawing on the literature relating to sustainable livelihoods approaches (SLA), the different components of the SLF and their relationships are discussed. The five different assets identified by the framework are related to the policy and institutional environment which enable people to achieve their livelihood outcome such as improved income, improved access to water and sanitation, and health among others.

The livelihoods of people in the urban areas are influenced by the unique context of the urban environment. Therefore literature sources on sustainable urban development, with a stakeholder-centred approach consistent with the SLA, were explored. Discussions on the triple bottom line principle, which places emphasis on people, planet, and profit in development programmes, are also referenced. Literature relating to the urban environment and people's livelihoods was also examined since the livelihoods of the urban community may also be influenced by the physical structure of the environment. Investigations on livelihoods call for a definition of the informal sector, therefore literature clarifying the scope of the informal sector is also referenced.

Some issues emerging from the literature which are relevant to a city context are discussed. Measures to help the people of the city to protect water and environmental resources should be based on sound understanding of their perceptions, attitudes and behaviour to water and environment. Thus, the theory of planned behaviour, discussed in this chapter, is relevant because it offers tools for investigating people's perceptions, attitudes and behaviour. The theory of planned behaviour is discussed in relation to the SLF, the triple bottom line principle, and the principles of sustainable development because together they help with the conceptualisation and analysis which can generate measures to protect and preserve natural resources such as water and the environment.

2.1 WATER FOR LIVELIHOODS IN THE CONTEXT OF THE SUSTAINABLE LIVELIHOODS FRAMEWORK

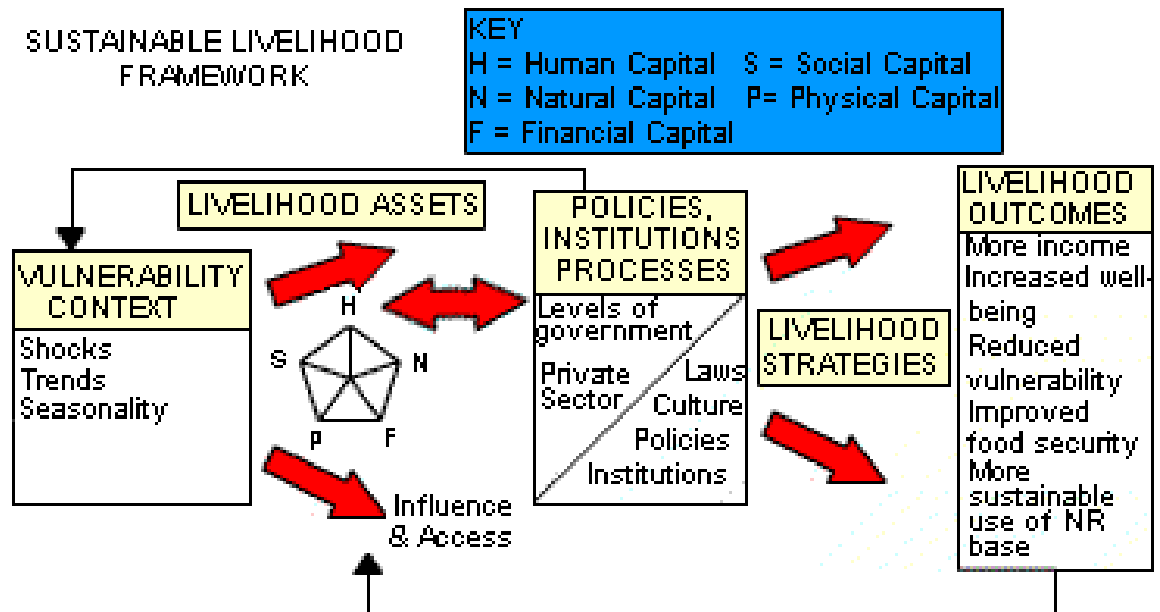
A discussion held at the Institute of Development Studies (IDS) in 1997, set the stage for the work that was to lead to the development of Sustainable Livelihoods Approaches (SLA) (Scoones, 1998). The Department for International Development (DFID) formally adopted a Sustainable Livelihoods approach following its 1997 White Paper on International Development, which emphasised DFID's goal of eliminating poverty in poorer countries and the promotion of sustainable livelihoods as one means of reaching that goal (Hussein, 2002). As a result, sustainable livelihoods approaches became important in DFID from 1998 (Carney, 2002; Ashley and Carney, 1999) and were successfully employed in many development-related scenarios (Farrington *et al.*, 1999; Carney, 2002).

The Sustainable Livelihoods Framework (SLF) (Figure 2.1) is a tool for understanding livelihoods, particularly of the poor. A definition is presented in Carney (1998:4):

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future while not undermining the natural resource base”.

The SLF provides the conceptual tools for the SLA. The livelihood approach itself builds on the findings of participatory poverty assessments carried out previously (Booth *et al.*, 1998; Hanmer *et al.*, 1997). Figure 2.1 below shows a conceptual representation of the Sustainable Livelihoods Framework and the internal and external relationships.

Figure 2.1: Sustainable Livelihood Framework (SLF)



Source: DFID Guidance Sheet (1999)

It has been noted that water resources come in different forms and have multiple uses (Soussan, 1998).

'If the goal of livelihoods analysis or intervention is to enhance the assets available to the poor, then from a water resources perspective it is important to understand: the potential resource base, including both the quantity and the quality of water resources available within the area of concern; water use and its contributions; and the legal, policy and institutional context within which resource use takes place and access is granted' (Soussan, 1998:181-182).

These are important issues for human and water interactions and the SLF helps to explain them to the extent that they are relevant for this investigation.

2.1.1 The Significance of the Sustainable Livelihoods Framework

As an entry point to study households, urban water and environmental quality and the supporting organizational structures, the Sustainable Livelihoods Framework presents the main factors that affect people's livelihoods and well-being and the relationships existing between these factors. The Framework is people centred, and does not work in a linear manner or attempt to present a model of reality (DFID Guidance Sheets, 1999; Guidance sheet 2.1). It helps stakeholders to look at livelihood issues from different perspectives.

A People centred analysis using the Framework is most likely to begin with people's assets, their objectives and the strategies adopted to achieve these objectives (Krantz, 2001). In line with the objectives of the study, the SLF presents an opportunity for conceptualising the drivers of household's livelihood activities and their implications within a city context. In order to do this, an analysis of the SLF is conducted and the study appropriately located in it to indicate the interrelationships between the different segments of the study.

2.1.2 The Vulnerability Context

An important component of the SLF is the Vulnerability Context.

'Factors making the Vulnerability Context are important because they have a direct impact upon people's asset status and the options that are open to them in pursuit of beneficial livelihood outcomes' (DFID, 1999; Guidance Sheet 2.2).

Important issues to consider in the vulnerability context are the influence of trends, shocks and seasonality on households' assets. Trends typically include: population trends, resource trends (for example in Accra, high demand but low supply of water in and polluted surface water sources) national or international economic trends, trends in governance (including politics; for example political decisions that may affect the way surface water sources are used or the cost of water supply such as Accra Metropolitan Assembly bye-laws which allow houses to connect wastewater to the surface water systems), and technological trends (for example access to or absence of state-of-the-art water treatment plants for drinking water and wastewater in Accra). Shocks can destroy assets directly (in the case of floods, storms, civil conflict etc.) or compel people to abandon assets and dispose them prematurely as part of their coping strategy. The perennial floods of Accra result in loss and damage to people's properties. Some lose their livelihoods. This can be problematic for the poor that often have low coping capacity (Rain et al., 2011).

Water-related disasters are one of the major problems of the modern world (Adikari and Yoshitani, 2009). This is expected to be exacerbated by the impacts of climate change. Population increase is expected to be a major driver of demand for water resources for at least another 50 years globally (Gardener-Outlaw and Engelman, 1997). Seasonal shifts in prices, employment opportunities, and food availability are some of the greatest

and most enduring sources of hardships for poor people in developing countries (Twigg, 2001). Seasonality can affect the price regime of particular water dependent occupations with the consequences on households with low capacity to cope. During periods of water supply rationing, households may be compelled to purchase water from alternative sources and this often affects the price of the water. Therefore knowledge of the vulnerability context is important in this study which sought to understand the drivers of households' water dependent occupations, assets and their relationship with the environment. In effect it encompasses the wider issues which are promoting or undermining people's livelihoods and yet is completely outside the control of households.

Analysis of vulnerability in the social context considers:

- initial well-being (nutritional status, physical and mental health).
- livelihood and resilience (assets and capitals, income and qualifications).
- self protection (capability and willingness to build a safe home, use a safe site).
- social protection (preparedness and mitigation measures).
- social and political networks and institutions (social capital and institutional environment) (Canon *et al.*, 2003).

The dimensions of vulnerability consist of the social, generational, and the political processes and arrangements that influence different people in various situations. Among the issues of vulnerability is the ability to cope with hazards (ActionAid International, 2000). In vulnerability analysis, attention is given to people who are more prone to damage, loss and problems in the context of various hazards. Some of the key variables that may make it possible to explain different levels of impact of hazards are occupation or livelihoods, ethnicity, gender, disability and health status, age and immigration status and the nature and extent of social networks. The relationships between the different factors of vulnerability will determine people's capacities, access to resources and ability to realize their rights (ActionAid International, 2000).

Vulnerability tends to be gender differentiated because of different capacities by men and women to withstand hazards. In addition to poverty, geographical location (such as different communities in Accra), conflict, ethnic associations, power relations, among others, influence levels of vulnerability. Vulnerability is dynamic and complex and

therefore any analysis tends to use predictive judgment on what is likely to happen and why.

Vulnerability analysis is important in relation to natural capital – land and water, because different people are exposed to different risks. Questions such as what volumes of water are available to households, their sources of water supply and the ability of different people to cope with different risks in water supply helped to assess vulnerability with respect to water.

In relation to land, understanding of land insecurities and their causes contributes to vulnerability analysis. In peri-urban Accra, some people rely on access to land for food production. Insecure rights to land can affect food security and investment in agriculture production and other land based livelihoods. Urban Accra is largely built up. In urban areas, security of land is essential for reconstruction, social and economic improvement. Effective planning of land use will help to prevent unsustainable exploitation of marginal lands (UN-HABITAT, 2010).

2.1.3 Assets in the Context of the Livelihoods Framework

The relationship between vulnerability and assets makes it important to present current ideas on the relevance of asset status in the framework and why it is important for a study on household livelihoods to understand their asset base. The Sustainable Livelihoods Framework (DFID, 1999) identifies five key asset or capital types upon which livelihoods are built (Figure 2.1): these are human, social, natural, physical, and financial.

It is important to have accurate and realistic understanding of people's strengths (assets or capital endowment) and how they try to convert these into positive livelihood outcomes. Assets combine in different ways to generate positive livelihood outcomes and therefore understanding the highly complex relationship between the different elements is an important step in the process of livelihood analysis which is expected to lead to action to reduce poverty. The five asset types are briefly elaborated below, indicating the relevance of these in the study.

Human Capital represents the skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies and achieve their

objectives. Though not sufficient in itself, it is necessary in achieving positive livelihood outcomes (Scoones, 1998; DFID, 1999; Guidance sheet 2.3.1). Human capital is particularly relevant to the situation in Accra because it is their skills, knowledge and the abilities which enable people to engage in one livelihood or another.

Social Capital represents the social resources upon which people draw in pursuit of their livelihood objectives. These are developed through networks and connectedness, either vertical (patron/client) or horizontal (between individuals with shared interest) that increase people's trust and ability to work together and expand their access to wider institutions, be it political or civic bodies (Scoones, 1998). Social capital was investigated in the situation of Accra to identify the extent to which people within communities with common and competing concerns are connected, thus potentially allowing co-development of ideas and innovations in livelihoods. In relation to water and livelihoods, it can influence access and use of water resources and was therefore important for the investigation.

Natural Capital comprises the natural resource base which provides resources and services (e.g. nutrient recycling, erosion protection, water sources, and livestock in Accra) useful for livelihoods (Richmond, *et al.*, 2003). There is some evidence that providing even relatively small amounts of water to poor people for personal and productive uses can improve their livelihoods (Polak *et al.*, 2002; Lipton and Litchfield 2003). Though many factors contribute to low crop productivity for instance, lack of water is important in many cases (Merry *et al.*, 2004).

Physical Capital consists of the basic infrastructure (changes to the physical environment which help people to meet their basic needs and be productive; housing, roads, etc in Accra) and producer goods (tools and equipment that people use to function more productively) needed to support livelihoods (Richmond *et al.*, 2003). *Financial Capital* is an embodiment of the financial resources (wages and other incomes, savings, loans, remittances, among others of those in formal and informal livelihoods in the city) that people rely on to achieve their livelihood objectives.

It is also noted that these assets can be converted from one form to the other, for example, human capital allows an individual to work and accumulate financial assets. Financial assets can also be converted to any of the other four identified assets. This

draws attention to the requirement, not only for assets and their drivers to be understood, but the interrelationships among them as well. It is also noted that these assets are influenced by the existing policy and institutional environment (Nicol, 2000).

2.1.4 Policies, institutions, and processes

There are different organisations in the government and the private sector. Some of the organisations in the government sector include those involved in political (legislative) issues, and may range from the local to the national. They include executive agencies such as ministries, departments and agencies; judicial organisations such as the law courts; and many other parastatal / partly governmental organisations (DFID, 1999; Guidance Sheet 2.4; Scoones, 2009). Organisations in the private sector include corporations and commercial entities, Civil Society organisations as well as Non Governmental Organisations.

For instance, in Ghana, the Ministry of Water Resources, Works and Housing is responsible for Ghana's Water Resources Commission (WRC) established by an Act of Parliament (ACT 522 of 1996) with the mandate to regulate and manage the country's water resources and other responsible organisations (Drechsel and Owusu-Bennoah, 2007). Along with these two, there are other key water and environment organizations [Public Utilities Regulatory Commission, Environmental Protection Agency, AMA-Public Health Department, Town and Country Planning, Waste Management Department; Water Research Institute, Ghana Water Company Limited, and Coalition of Non-governmental organisations in the Water Sectors] whose activities and operations affect what people do, how they do it and the returns they achieve from it.

These organisations are very important because they formulate and implement policy and legislation, deliver services, and perform diverse functions which influence livelihoods. This makes it imperative for a study on livelihoods, water and environment to also understand the way things are carried out in these organisations and how innovative interventions can ensure sustainable use of water and environmental resources in the city.

The processes include policies, legislation, institutions, culture and power relations (such as gender, age, social groups, etc). The processes shape people's livelihoods. They operate at all levels including households and effectively determine access to

various types of assets, livelihood strategies and to decision-making bodies and sources of influences. They influence the terms of conversion between different types of assets and the returns (economic and otherwise) to any livelihood strategy. They also have a direct impact on whether people are able to have a feeling of inclusion and well-being (Nicol, 2000).

Policies inform the development of new legislation and determine the performance of the public and the private sector. For an example, the National Water policy of Ghana) was launched in 2007 with the overall goal of achieving:

‘sustainable development, management and use of Ghana’s water resources to improve health and livelihoods and reduce vulnerability, while assuring good governance for both the present and future generations’ (MWRWH, 2007: p13).

This is intended to be achieved by addressing relevant issues under water resources management, urban water supply and community water and sanitation.

Institutions are informal practices engaged in by organisations that tend to structure relationships and to some extent make the behaviour of organisations predictable. They are ‘customs’ or the way things are done in organisations (Mathauer, 2004). Further discussion on processes is presented in chapter six.

The above shows that in order to improve understanding of people’s livelihoods and use of water and environmental resources, it is important for the analysis to situate people’s efforts within the prevailing policy and institutional environment. This is particularly important because it bears influence on how people can do things in a way (livelihood strategies) which will maximise the returns on both their income and efforts at improving well-being). Further details on institutional analysis are presented in sections 2.6.4 and 2.6.5.

2.1.5 Livelihood Strategies

The term Livelihood Strategy refers to the different combination of activities (including productive activities) and choices which people make in order to achieve their livelihood goals. In some literature sources, the term adaptive strategy is used instead (UNDP and MONROE, 2009). An adaptive strategy is what people do normally to achieve their livelihood outcome (that is what they do to let things go well) whereas a

coping strategy is resorted to in times of difficulty or crisis (that is, what they do when things go wrong) (UNDP and MONROE, 2009).

The Sustainable Livelihoods approach seeks to develop an understanding of the factors which underlie people's choice of livelihood strategy and then to reinforce the positive aspects while mitigating the constraints or negative factors. Several livelihood strategies can be adopted at the household level within the frame of productive use of water.

2.1.6 Use of Household Water for Productive Activities

The concept of 'productive use', in this context relates to water used for small scale, often informal activities whose primary purpose is improved nutrition and/or income generation. The term 'household level' shows the relatively small scale of the activities (and quantities of water involved), and the primary social unit in which the use of this water takes place (Moriarty *et al.*, 2004). Many households in Accra are involved in water dependent activities and in terms of livelihoods significance, for some, the income from these informal enterprises represent over 80% of their earnings as there is demand for such services, and in addition they provide employment and support a chain of beneficiaries (Abraham *et al.*, 2007; WaterAid, 2001).

However, understanding of the contribution that water makes to livelihoods improvement and poverty reduction is lacking in the literature (Soussan, 2003). Therefore a good understanding of the strategies put in by households to achieve specific objectives is important for interventions.

2.1.7 Livelihood Outcomes

Livelihood outcomes are the achievements or outputs of livelihood strategies. '*People aspire to a range of positive outcomes*' (Carney, 1998:9). Thus, it is important to listen to those with whom one works with in order to learn from them '*about their own objectives, their own understanding of what it is to be in poverty and to escape from it*' (Carney, 1998:9). This is one of the bases for adopting a people centred approach in this study.

The SLF is a tool for understanding the factors that influence poverty since in many cases, households' livelihood outcomes are directed towards reducing poverty. Whereas the SLF places the five assets (human, social, natural, physical, financial) at the centre

of the approach, other approaches (section 2.1.8) have developed other perspectives on poverty. Therefore integrating other dimensions of poverty analysis with the SLF is expected to improve understanding of poverty. This is expected to enrich options and interventions to achieve livelihood outcomes.

2.1.8 Other Dimensions of Poverty

The poor are particularly vulnerable to trends, shocks, and seasonalities that disrupt their livelihoods and set back any small progress and achievement. The poor are far less resilient and may suffer from multiple vulnerabilities (Twigg, 2001). For people with very few or no assets, the opportunities provided by improved access to good quality water for both domestic and productive purposes are significant.

Poverty is also expressed in several other forms: food insecurity; lack of shelter; poor access to health care; illiteracy; unemployment, lack of access to clean water; powerlessness, lack of representation and freedom (World Bank, 2009). *‘In the recent past poverty definitions have broadened to include social indicators (infant mortality rates, literacy, women’s status, access to drinking water, etc.)’* (Black and Hall, 2004: p.13).

A common way of differentiating the poor is on the basis of income and or access to food. Households who have enough income and entitlements to cover their basic food needs are considered ‘moderately’ poor; those whose income is not enough to reach 85% of the minimal calorie intake to maintain a normal life style are considered as ‘extremely’ poor (Frans and Soussan, 2004). The Chronic Poverty Research Centre (CPRC) suggested another categorization of the poor, mainly based on the duration of their poverty as: occasionally poor, cyclically poor, usually poor, and always poor (CPRC, 2004-05).

Another categorization can also be made based on the main cause of people’s poverty such as ecological vulnerability, a poor resource base, or demographic factors (Frans and Soussan, 2004). Conventional poverty analysis usually underestimates the role of water in livelihood provision (Black and Hall, 2004). This, the study intends contributing to filling the gap.

Well-being and poverty in Ghana vary between rural and urban areas and between men, women, young adults, youth, and children. Whereas the rural poor identify issues such as food insecurity, inability to have children, disability and ownership of property, urban dwellers emphasize lack of employment, the unavailability and inadequacy of social services, lack of skills training, housing, and capital, among others as being linked to poverty and well-being levels (Appiah, 1999; Nkum and Ghaty, 2000). It is also realised that poverty is a composite of both personal and community life situations, where on the personal level, poverty is reflected in an inability to gain access to basic community services (Batse *et al.*, 1999 and Nsiah-Gyabaah, 1998).

Overall incidence of poverty in the Accra Metropolitan Assembly [AMA] is officially ranked at 8% and in the Ga districts (Ga South; Ga West; Ga East; in the Greater Accra Region of Ghana; see Figure 1.2) as 26% (NDPC, 2005). Including the non material aspects of poverty in its measurement may reveal a different picture in a city where over 60% (Obuobie *et al.*, 2006) of the population lives in what are known as high density, low income settlements, with the majority of city dwellers using public toilets.

Many of the studies carried out so far in Accra on water (Obuobie *et al.*, 2006; Amoah *et al.*, 2005; Biney (1998); Cornish *et al.*, (1999) fall short of systematically linking to key issues on livelihoods and well-being. Particularly missing are the inclusion of the five capital assets and their linkages with the legislative and policy framework in the water and environment sector.

It is important to also note that the components of the Sustainable Livelihoods Framework relating to livelihood strategies and their outcomes are a platform for understanding and reducing poverty and responding to water and environmental problems as discussed above. This is important for ensuring sustainable urban development. Therefore the study was designed to specifically understand the interrelations between water dependent activities of practitioners, their assets or capital, their construct of poverty and the strategies to get out of poverty in an urban and peri-urban context. The urban context is unique in its opportunities and problems. A sound understanding of this is important for placing livelihoods, water and environmental issues and concerns in perspective.

2.2 SETTING THE CONTEXT OF THE URBAN ENVIRONMENT

The urban environment is a complex mix of natural elements and the built environment, whose quality is much influenced by:

‘its geographical setting; the scale and nature of human activities and structures within it; the wastes, emissions and environmental impacts that these generate; and the competence and accountability of the institutions elected, appointed or delegated to manage it’ (OECD, DAC, 1996: p.5).

In general, urban centres are places of intense activity and densely grouped facilities, characterized by the employment of people in occupations such as trade, commerce, manufacturing and service industries, as well as various forms of agriculture (crops, livestock, marketing, input supply etc) (UNCHS, 2001).

Opportunities and challenges for development are increasingly concentrated in cities and towns (i.e. the urban centres). Cities and Towns are the engines of various levels of economic and social development (Glaeser *et al.*, 1992). Problems associated with development make the management of cities challenging to authorities (European Commission, 2002; DFID and UN-HABITAT, 2002; Potter and Salau, 1990).

The urban context is expected to aid understanding of issues and therefore allow findings in the study to be placed in a proper perspective. This call for methods and approaches for systematically identifying and analysing relevant urban issues that can aid in improved livelihoods and sustainable use of water and environmental resources.

2.2.1 Identification and analysis of urban issues

In their study, Bai and Imura (2000), based on their judgement, categorized urban environmental issues into three groups by taking into consideration the driving forces behind the problems, major impacts and the spatial scale of the impacts (Table 2.1). Type I occurs in some cities in the developing world; Type II is relevant in some East Asian countries and though Type III is relevant in wealthy developed countries, the consequences can be felt globally (for example global warming). These three types of urban environmental issues can occur at different stages of urban development. Cities can take policy measures to address the impacts of these problems (Bai and Imura, 2000). This is why it is important for urban studies to be carried out with sufficient understanding of the urban context. The water and environmental problems in Accra, as

discussed in chapter one, are examples of the relevance of Type I problems, as discussed above. Such analysis obviously creates options for city authorities and regulators to take action to address the identified problems.

Table 2.1: Types of urban environmental problems

Type	Typical Issues	Causes	Major Impacts	Spatial Extent of Impacts
Type I: Poverty-related issues	<ul style="list-style-type: none"> • low access to safe water • lack of sanitation facilities • organic pollution of water bodies. 	<ul style="list-style-type: none"> • low infrastructure • rapid urbanization • income disparity. 	<ul style="list-style-type: none"> • sanitation-related health impacts such as diarrhoea, infections. 	Local.
Type II: Rapid-growth related issues	<ul style="list-style-type: none"> • air pollution (various forms of sulphur oxide) particulates) • water pollution (heavy metallic subjects, high organic matter content, • industrial solid waste pollution 	<ul style="list-style-type: none"> • rapid industrialization • low rates of emission treatment • lack of effective management. 	<ul style="list-style-type: none"> • typical industrial pollution disasters • Minamata disease (neurological syndrome caused by severe mercury poisoning, Onsan disease(neurological , sensation, respiratory, and skin disease) • deterioration of regional ecosystems. 	Local and Regional.
Type III: Wealthy lifestyle-related issues	CO ₂ emissions, (various forms of nitrogen oxide) concentration; <ul style="list-style-type: none"> • municipal wastes • dioxin. 	<ul style="list-style-type: none"> • high consumption lifestyles • low local incentives for improvement. 	<ul style="list-style-type: none"> • global warming • chemical ingredient and dioxin-caused abnormalities in infants, • over-extraction of resources. 	Regional and Global.

Source: Bai and Imura (2000)

The issues in a city are inter-related, where for example, access to informal urban activities influence the housing and health conditions of low-income households (Potter and Salau, 1990) and preventing endemic disease is part of health education, citizen responsibility, and urban infrastructure provision. These are also influenced by changes in municipal budget allocations and the organizational capacities of urban service providers (Potter and Salau, 1990). Therefore urban studies will benefit from a holistic approach rather than a narrow one. This emphasizes the importance of a holistic approach to dealing with urban issues and challenges in Accra. These multiple interdependencies require understanding to allow for effective interventions in the development of cities and responding to their inherent problems.

A second approach to understanding the issues is through what is called a multi-dimensional analysis (Safier, 2001) as presented in Figure 2.2 below.

Figure 2.2: Multi-dimensional analysis of the urban environment



Source: Safier (2001)

Multi-dimensional analysis shows how urbanisation and cities can contribute to the advancement of development targets and objectives, such as the Millennium Development Goals (MDGs). It identifies five primary dimensions namely, urban: Economy, Governance, Infrastructure, Society, and Environment. Such an analysis will offer an opportunity for urban and environmental managers and decision makers to consider the interrelationship of urban issues and problems. Such an attitude will ensure that, for example in responding to particular problems in Accra, new problems are not created for the discomfort of society and the destruction of water and environmental resources. This is most likely to be achieved through an effective governance system.

Multi-dimensional analysis was also relevant in the investigation in Accra because it looked at water and environment, and society (in terms of the people who were involved). Some aspects of the local economy (in terms of livelihoods), governance (in

terms of policy and institutions) and a limited component of city planning (in terms of interactions with the Town and Country Planning Department) were also considered in the study.

Multi-dimensional analysis is important because it draws different bodies of knowledge to stimulate discussions relating to livelihoods, water, and environment. Development must not create problems for future generations and for this to happen it should be sustainable. Therefore such additional insights from the combination of different bodies of knowledge were considered in order to help the study to suggest initiatives, interventions and options which will ensure sustainable urban development.

2.2.2 Sustainable urban development

Economic growth leads to urban development and therefore becomes the primary force behind human population growth related factors, both production-related (e.g. capital and labour), and supplementary ones (housing, public facilities, roads, etc.) (Portnov, 2006). The Brundtland Commission report in 1987 defined sustainable development: *'Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs'*. It was further developed in practical terms at the World Environment Conference in Rio de Janeiro in 1992 with Agenda 21 and Local Agenda 21. The sustainability concept was central to adopting an environmentally sensitive approach to development. The Local Agenda 21 concept has since been taken up by many cities in countries around the world.

The sustainability concept suggests that development will consider the full implications on all sectors of society and the environment (European Commission, 2002). The term 'sustainable development' can be considered as having two components: sustainable - the aspect that relates to the environment, intended to send the message that *'the environment should continue its normal natural cyclic functions without disruption; and development, which covers socio-economic change'* (K' Akumu, 2007; p. 222). Equity is central to the principles of sustainable development to ensure that future generations are not deprived of their share of resources for livelihoods (K' Akumu, 2007). Sustainable development promotes the application of policies that enable poor families to participate in and benefit from economic growth and social and political opportunities (Loughhead *et al.*, 2001).

In this vein there is some relationship with the Sustainable Livelihoods Framework (SLF) which promotes a people centred approach seeking to enable households enhance their assets base in a manner that will reduce poverty. Since reduction of poverty is central to the Sustainable Livelihoods Approach (SLA), its promotion of improvements in the asset base of households should not be done in any way that will compromise the ability of future generations to also enhance their livelihood base - after all it is a '*Sustainable*' Livelihoods Approach.

Thus both the SLF and the sustainability concept (supported also by the multi-dimensional analysis) can be applied to promote a form of development that takes into account the well-being of society (people), environmental friendliness of technologies and approaches (planet) and ensures economic viability (profit) of development such that there is a good balance. Such a balance relates also to the triple bottom line principle (the three 'Ps' of people, planet, and profit).

2.2.3 Triple Bottom Line Approach to Sustainability

The term 'Triple-bottom-Line' (TBL); [Figure 2.3), was first coined by Elkington in 1994 (Elkington, 2008). In practice, the TBL approach presents a set of flexible tools that can be applied in corporate planning, reporting, and assessment/decision making, where one of the primary objectives of the user is progress towards the goal of 'sustainable development'. Elkington (1998) refers to the three components as the delivery of environmental quality, social equity and economic prosperity by business. However, it is important that the performance of these three factors are considered together in an integrated approach of sustainability (Vanclay 2003; Christen *et al.*, 2006; Slaper and Hall, 2011; Clarke, 2001; EPRI, 2010).

In the recent past, profits and costs were the main consideration when calculating commercial projects' worth and value. As resources became scarce and ecosystems were threatened by human behaviour and practices, and corporate activities, many companies, organizations, and institutions adopted Triple Bottom Line (TBL) or "3Ps" approach. This method accounts for the value that projects contribute to people (social), the planet (sustainability) and profit (financial return) (Alvarado *et al.*, 2008; McDonough and Braungart, 2002).

Figure 2.3: The Triple Bottom line



Source: <http://www.examiner.com/green-business-in-baltimore/green-companies-save-money-and-help-the-planet-with-a-triple-bottom-line-approach>

Furthermore, the corporate world has demonstrated a willingness to respond to public concerns for improved performance on non-economic issues by embracing Triple Bottom Line (TBL) approach (Kimmet and Boyd, 2011). Some of the factors driving this shift in public reporting include a response to mandatory requirements; consistency with emerging public commitments and demands from stakeholders for greater transparency about policies and results (Marks, 2004; Group of 100, 2003).

In financial accounting, TBL reporting is the disclosure of information about an organisation's economic, social, and environmental performance (Kimmet and Boyd, 2011; Goonetilleke and Yigitcanlar, 2010). The TBL is considered as a method of including social needs in economic plans and modifying corporate (or organisational) behaviour through institutional policies and self-regulation (Kimmet and Boyd, 2011; Elkington, 1998; Goonetilleke and Yigitcanlar, 2010).

However, the TBL application goes beyond business to include the broader goals of sustainability. In its application in land and water management, it is observed that land and water would continue to be developed to meet fundamental human needs. However, it is important to ensure that the effective allocation and utilization of land and water resources do not only meet human needs, but are also within the carrying capacity of the resources.

Thus, there is the need for a sustainable management of water and environmental resources in Accra which will recognise the interrelationships between ecosystem needs and the dynamic nature of interactions in a complex environment. Consequently, a holistic approach is needed to understand the impact of urban developmental processes on people and water and environment in Accra. The sustainability perspective will therefore require that appropriate methods and technologies are applied to specific locations, recognising that one method does not necessarily fit all. This calls for understanding the urban structure within which the study takes place, which makes recommendations more relevant to specific urban typologies.

2.2.4 Urban structure

There are several models which explain where different types of people and activities are found in urban centres in relation to public and private spaces (Daniels *et al.*, 2005). The order of size, spatial distributions and inter-related settlements in an area constitute some of the key issues of the theories about settlement patterns, most notably the central place theory as presented by Christaller (1933); and others (Burgess, 1924; Hoyt, 1939; Harris and Ullman, 1945) (see also Appendix 2.1 for further details). The central place theory focuses on the settlement of service centres as places where goods and services are sold (Daniels *et al.*, 2005; Wirth, 1938).

The wealthy, not only have access to the most favoured housing areas, but have much better service provision than the poor in some developing world cities like Calcutta, or slum dwellers in an inner city slum or ghetto of a city such as New York. Social inequalities reflect unequal access to space and desirable locations; so that spatial and social inequality tends to show in tandem (Daniels *et al.*, 2005; Wirth, 1938).

Often the business areas move to the centre of the city – to central business districts. Beyond this zone, there are various land uses to serve different purposes (Beavo, 1977; Susser, 2002; Potter and Salau, 1990). Although in Accra the central area hosts some business structures and activities, the trend has changed in the recent past whereby business and large shopping centres are scattered across the city. In the case of Accra, since the most favoured parts of the city are available to those who can afford them, the market situation increasingly restricts the poor to areas with low infrastructure provision. In situations where both the poor and the rich have to pay for certain facilities, the low income status of the poor put them at a disadvantage. Since different

locations differ in their characteristics, it was important for this investigation to explore issues and their relative importance, from the perspective of people living in different locations. There are other problems which link up with the urban structure to create complex problems for people in cities and city managers, one of which is termed 'urban primacy'.

2.2.5 Urban Primacy

Urban primacy has been defined as a condition where a single city dominates other cities in a country's urban system (Henderson, 2003). Since its early formulation, the concept has been modified to include the notion of two-city primacy (e.g. Brazil's Sao Paulo and Rio de Janeiro), regional multiple-city primacy (e.g. India's urban system), and multicentric urban systems (Kasarda and Crenshaw, 1991). However, the urban systems of the developing world tend toward single-city primacy, and the list of such primate systems is long (Kasarda and Crenshaw, 1991).

Preference for a primate city creates an uneven playing field in competition across cities (Henderson, 2003). The preferred cities attract migrants and firms from hinterland areas, creating a highly congested high cost-of-living metropolitan area. Primacy is a feature not only of developing countries, but also of many developed countries (Henderson, 2003). Various analysts have indicated the advantages of high primacy for economic development (Hansen, 1990), such as the concentration of industries, labour, market, and social infrastructure development, among others.

However, in a developing country, the infrastructure needed for industrialization, such as transport and communications, education facilities, or urban utilities, are often inadequate and may only be found in one or two urban places. These factors played their part in the primacy of the urban systems of less developed countries (Roberts, 2003). It is important to also note that the capacity of African cities to cope economically, environmentally, and politically with such high concentrations of people in primate cities is problematic (Bala, 2009). Many suggest that disadvantages of African primate cities, such as social costs of a progressive overloading of housing and social services, of increased crime, pollution and congestion, far exceeds their expected urban advantages in terms of economic progress (Todaro, 1997).

In relation to Accra, though many businesses concentrate in the city, there are cities like Sekondi-Takoradi, Tema, Kumasi, and Tamale etc, which also host different economic activities common in Accra and have populations which are gradually rising (indicated below). However, Accra continues to attract the national population (see the extent of spatial development: Figure 1.2). It hosts the central office of all national and international organisations. Much more commercial activities appear to take place in the national capital than elsewhere and it has a greater concentration of manufacturing companies. The year 2000 population and housing census put the population figures as follows: Accra: 1,658, 937; Kumasi: 1,170,270; Tamale: 202,000; Sekondi-Takoradi: 289, 595; Tema: 141, 479. The population figures are expected to be higher when the 2010 population and housing census are released. The 2000 population figures depict a two primate city for the country.

Therefore in such a dynamic setting, it is important for city managers to have in place sound operational arrangements for managing the city. This is why the investigation of key organisations in the water and environmental management sectors also includes those mandated specifically to take charge of spatial planning. In the case of Ghana, the Town and Country Planning Department is responsible for spatial planning (see chapter six). Engaging with the department of planning in the city was to help throw light on their operations and in terms of the study, how their efforts could be maximised to enhance water and environmental management in the city.

2.2.6 Operation and structure of urban spatial planning in Ghana

Ghana has four levels of decentralized governance made up of the Regional Coordinating Council (RCC) on the first level, the Metropolitan/ Municipal and District Assemblies on the second level, Town/Zonal/Urban/Area Councils on the third level, and the Unit Committees on the fourth level (Awoosah *et al.*, 2004).

At the national level, the National Development Planning Commission (NDPC), by NDPC Act 479 of 1994, is mandated to co-ordinate all national development plans. It must provide the framework and direction for national development planning and implementation. It provides guidelines for the preparation of district/city development plans to ensure that each district plan is in line with the national development plan. At the regional level, the Regional Coordinating Council is mandated to coordinate district

development activities. It also monitors, coordinates and evaluates the performance of the district assemblies in the region (Botchie, 2000).

Ghana has ten regions, each of which comprises metropolitan, municipal, and district assemblies. There is the Ministry of Science and Technology, in which is the Regional Town and Country Planning Department. Each district assembly also has a Town and Country Planning Department, which is a decentralized department of the Regional Town and Country Planning Department. The Town and Country Planning Department [TCPD], is charged with the preparation of spatial and land use plans and setting of planning standards and regulations (WaterAid, 2009).

Under the Local Government Act 462 of 1993, metropolitan, municipal and district assemblies [MMDAs] are to involve the local communities in development at the district level. This function, provided it is carried out, is expected to assist the MMDAs not only to prepare district development plans but also to ensure public participation (Botchie, 2000). The resulting spatial or land use plans are also approved by a multi-stakeholder group in the MMDAs (interviews with AMA-Town and Country Planning Unit, 2009). Further details on spatial planning in Ghana are presented in Appendix 2.2 which shows how spatial planning is being restructured under the Land Use Planning and Management Project at TCPD (TCPD and LUPMP, 2011).

There are two main types of plan: the statutory land use plan (typically taking a long time to prepare and approve, but having a base in law) and the Strategic or Medium Term Development Plan (focusing on priority objectives with support from key stakeholders). The latter ensures that key investments are in place and that there is a suitable financing and management system. The Accra Metropolitan Assembly is responsible for the Medium Term Development Plan. In the case of Ghana, the Ghana poverty reduction strategy II and Ghana's Vision 2020 (NDPC, 2005) have become the key strategy documents to guide development at the national level. The National Development Planning Commission is responsible for producing national level development plans.

Since there are many stakeholders involved in the planning process, planners are often confronted with different views on how to achieve sustainability (Holden, 2008). Environmental improvements need to be developed as part of urban development

policies (Potter and Salau, 1990). Building a sustainability strategy must take advantage of the diversity in approaches to sustainability in planning based on local context, specific political opportunities and civic resources.

The study was expected therefore to broaden the scope of urban policy makers and planners so that urban water and environmental solutions are provided, based on specific location-related socio-economic problems in the city. Since the locations in the city are at different levels of infrastructure provision, an analysis of water and environmental issues which factors in the idea of place will help draw the attention of city managers to common problems in communities with similar physical characteristics. This is important because it will enable the city managers to respond to specific location-related problems, such as migration (population) related water and environmental problems which tends to be common in low income and other informal settlements. Thus, the study recognised that migration, which results in population rise or urbanisation, is a major location related problem for city managers because of the demand placed on access to livelihood opportunities, water and environmental resources. This made it imperative to consider how understanding of aspects of migration may provide insights into water and environmental management.

2.2.7 Urban migration, housing, and the poor in developing world cities

The key determinants of urban growth can be placed under three groups: (a) the natural increase of urban populations; (b) migration, both intranational (rural-to-urban and urban-to-urban) and international; and (c) boundary redefinition through annexation of surrounding areas (Kasarda and Crenshaw, 1991; Carr, 1997; Russell and Jacobson, 1998).

Migration could be voluntary or forced. Forced migrations are driven by traffickers, wars or displacement by natural disasters. Certain cultural constraints as well as gendered international emigration and immigration policies can limit women's ability to migrate. In many instances women have very little influence on migration decisions in the home (Jolly and Reeves, 2005; Hunter, 2005; Piper, 2005).

Some of the key factors which influence people's decision to migrate include economic, social, political, and other incentives. Such incentives may include inequalities within and between countries. It could be a decision to join a spouse or to escape from certain

gender constraining norms (Jolly and Reeves, 2005). However, evidence indicates that most people move for economic reasons, and over time as economic conditions at alternative destinations change, migration streams alternate accordingly (Gilbert and Jugler, 1996; Martin and Zurcher, 2008).

Conditions such as rising population, inflation, and falling economic standards have slowed down the pace of development in cities in developing nations. Therefore, housing provision lags behind demand. Furthermore, the state and standard of such housing ranges from ordinary wooden shelter, to brick, and cement block buildings. Some of these houses are shared by different tenants. The quality of the surrounding environment also varies and has different infrastructure provision (Carr, 1997).

Over half the housing in developing country cities is of the informal or spontaneous type built by the poor themselves, but the proportion varies from one country to another depending on local socio-economic and governance circumstances. Often lands for spontaneous housing have been acquired illegally and with no planning permission. The majority of occupants of such houses are usually tenants (Drakakis-Smith, 1992).

In the case of Accra, the communities (that is localities) with low infrastructure provision tend to be located towards the city centre. People migrating from other parts of the country to Accra could be poor people in search of jobs or wealthy people accessing better opportunities in employment, or seeking educational opportunities. Many such poor migrants lack the capacity to afford decent housing and sometimes find themselves in places which lack adequate infrastructure.

Such people may have to identify alternatives which often are sources of negative impact on the environment; for example, the 'Sodom' and 'Gomorrah' slum located near the Korle Lagoon area; people who live in kiosks located on the banks of the Odaw-Korle River Catchment. Such migrants may also struggle to access job opportunities in the city as is evident in the case of many young men and women who serve as head porters in the central business area, the majority of whom are thought to have migrated from the northern part of the country (the researcher's personal knowledge of the city). Aside from the north, Accra continues to attract people from all parts of the country. Once they become part of the city population, they contribute to the prevailing poverty levels and that is why such a study of livelihoods, water and

environment required an integrated approach that draws on interrelationships between the relevant urban factors. Such an approach will support city initiatives to promote jobs and other livelihood opportunities.

2.2.8 Job Creation and the urban informal Sector

The number of unemployed globally stood at 205 million in 2010, unchanged from the previous year and 27.6 million higher than in 2007, with little hope for this figure to revert to former levels in the near term. This raises some concerns. Furthermore, the global unemployment rate stood at 6.2% in 2010, versus 6.3% in 2009, but still well above the rate of 5.6 % in 2007 (ILO, 2011).

Additionally, with more than three-quarters of workers in Sub-Saharan Africa in vulnerable employment and around four out of five workers living with their families on less than US\$2 per day, sub-Saharan African economies experienced difficulties in accessing decent work before the global economic crisis (ILO, 2011). Informality is expected to provide an alternative path to job creation and social mobility (Solorzano, 2003). The key challenge to studying informal employment and job creation rests in the definition of the urban informal sector.

A definition of informality is provided by ILO (Solorzano, 2003; p. 15): Types of employment classified as informal;

‘ ...within the group of commercial family enterprises are those created with the purpose of generating jobs and income for their participants (survival logic); having a reduced production scale; having a primitive organization without a clear distinction between capital and work or between the household and establishment resources; and using occasional labour or family or social relations without contracts. Their organization is not deliberately aimed at the evasion of taxes, social security payments or other existing legislation. The latter implies that informal activities are different from covert activities and those within the so-called underground economy’.

In the study of urban water dependent livelihoods, the definition of the informal sector clarifies the sector of the economy in consideration, since water dependent occupations could be either in the formal or informal sector of the economy. This is particularly important as household incomes are a combination of both formal and informal income sources in some of the instances. Although the study focuses largely on Accra, it is recognised that water catchments do not follow artificial city boundaries and therefore it is important for such a study to consider some of the relevant livelihood, water and

environmental issues in the peri-urban areas. This therefore called for a snap shot of the peri-urban setting and also to clarify the peri-urban context within which the study was carried out.

2.2.9 Defining the peri-urban setting

Key factors which distinguish rural from urban areas include population size, population density, infrastructural provision, administrative boundaries, and economic activities (Tacoli, 1998). The peri-urban interface however, represents a combination of urban and rural setting and this has important consequences in terms of the provision of services (Allen *et al.*, 2008; Iaquina and Drescher, 2001).

‘From an environmental perspective, the peri-urban interface can be characterized as a heterogeneous mosaic of “natural” ecosystems, “productive” or “agro-” ecosystems, and “urban” ecosystems affected by resources demanded by urban and rural systems’ (Allen, 2003:136-137).

This results in constant environmental changes which impinge upon the livelihood strategy of communities by increasing or decreasing their access to different types of capital assets (including access to natural resources such as land, water, energy) (Brook and Davila, 2000). The above indicate that there is no single definition for the peri-urban interface. The peri-urban interface is also perceived as spatially and structurally dynamic. In terms of the spatial dimension, it is the transition zone between urbanized lands and lands for agricultural purposes. It is identified with mixed land uses. The peri-urban areas shift over time as cities expand. It is a zone of changing social and economic structure, leading to pressure on natural resources and the labour market (Rakodi, 1998).

The different socio-economic situations of people living in the peri-urban areas imply that different categories of people can access water and environmental resources differently (Allen *et al.*, 2008). Lack of water in the peri-urban areas may not be limited to poor households, but members of other income groups, especially in situations where there is limited access to water supply. However, although people can buy water from their neighbours, lack of supply in general makes access difficult (Allen *et al.*, 2006a; Allen *et al.*, 2006b). In general, since it is the role of women and children to fetch water and perform water-dependent household tasks (such as cooking, cleaning, washing,

childcare and hygiene), they bear most of the burden of inefficient water supply (Allen *et al.*, 2006a; Allen *et al.*, 2006b).

A distinctive characteristic of the peri-urban interface is that social groups are heterogeneous and in constant transition. This makes it difficult to establish clear institutional arrangements that deal effectively with the management of natural resources to promote livelihoods (Allen, 2003; Brook and Davila, 2000). Thus, the organizational and institutional context may also be different, with some administrative activities falling outside the remit of rural and urban governments (Narain and Nischal, 2007). According to Narain and Nischal (2007:262):

‘the co-existence of such different interests, groups, activities and institutions introduce some practical problems in developing policy options for the peri-urban interface’.

These practical problems are also worsened by the dynamic nature of the peri-urban boundaries. This makes it imperative for the approach to responding to water and environmental needs in the peri-urban interface to be well adapted in terms of the institutional and organizational arrangements as well as the implementation of programmes. Thus, the study is carried out within the context of a peri-urban environment that is dynamic, with some unique features.

In the situation of Accra, the peri-urban areas are administered by another district (Ga East District Assembly: see Figure 1.3). People live in the peri-urban areas and commute daily to Accra to transact business. Large areas of the boundary outside Accra share similar characteristics with many parts of the city due to the influence of urbanisation. Therefore the choice of communities in the peri-urban areas was selected to reflect some peri-urban features. This was particularly important for the study because of the additional insights in knowledge which it was expected to bring to the study.

As surface water flows from the peri-urban into the urban areas, it comes under the influence of more residential and commercial activities and this has impacted the water negatively. This called for thorough understanding of the relevant factors of pollution of the surface water so that interventions could support improvement in this particular

asset base of the urban and peri-urban dwellers who depend on it for specific uses and livelihoods (and also to ensure a clean and healthy environment).

2.3 WATER AND THE URBAN ENVIRONMENT

Urban water includes rivers, streams, ponds, lakes, and the wastewater system, as well as treated water (in cities and urban areas). Domestic effluent (wastewater) and urban run-off resulting from rain-fall contribute most of the inflow into urban surface water bodies in Ghana. Domestic wastewater usually contains grey water (sullage), that is wastewater from washrooms, laundries, and kitchens but it may also contain blackwater generated in flush toilets (Obuobie *et al.*, 2006).

Blackwater may contain both urine and human waste. The mixture is termed sewage if it flows in a sewerage system or septage if it is in a septic tank (Obuobie *et al.*, 2006). Wastewater is also differentiated from faecal sludge, which is collected and transported from on-site sanitation systems by vacuum trucks for disposal or treatment (Strauss *et al.*, 1997).

Urbanisation increases the pressure on the urban water resources. Though urban water provides useful environmental and economic services globally, it faces several problems such as mismanagement, growing competition for its use, degradation, and sometimes pollution by pollutants of unpredictable effects. In the same vein, the Odaw-Korle River system of Accra faces persistent pollution problems.

2.3.1 Odaw-Korle River Catchment of Accra

Drainage in Accra usually consists of natural drains (channels) and some major storm water drains (constructed channels). A network of small drains (channels) is in place to serve the dual purpose of transporting storm water and domestic wastewater. In the case of the Korle Lagoon (which is part of the Odaw-Korle River system), its secondary function as a central drainage system emptying its content into the sea, resulted in it becoming shallow over time because of excess siltation and solid waste from human behaviour and subsequently introduced into the lagoon by runoff (Biney, 1982).

This necessitated the process of ecological restoration started in the year 2000. The Odaw-Korle catchment (also known as the Odaw Catchment; Figure 1.3) covers an area of 250 km². It is a complex of the Odaw River and the Korle Lagoon. The Odaw River

used to drain into the Lagoon, until it was by-passed via a tube into the sea as part of the Korle Lagoon Ecological Restoration Project [KLERP]. The course of the river is natural, but its channel is largely constructed as it flows through the city. The principal streams that drain the catchment are the Odaw River and its tributaries at Nima and Dzorwulu.

The Odaw-Korle-catchment contains the major urbanised areas of Accra. About 60% of Accra (Figure 1.2) is drained by the Odaw-Korle catchment. Many of the drainage channels are poorly developed and maintained (personal observation). Erosion and siltation of drains (channels) is a major problem in the catchment. In low-lying areas, seasonal flooding during and after rains is a problem, resulting in loss of property. This also has implications for the water quality of the river as debris is washed into it. Other smaller drainage basins exist in Accra and provide respective economic and environmental services to the city. The location of the river, in an urban environment makes it susceptible to environmental pollution. These pollutants are usually in different forms.

2.3.2 Urban water pollution and its effect on water quality

Pollutants are potentially harmful if found at the wrong place at levels above the natural background concentration. They may have been released on purpose, for example pesticides, or may be an unwanted waste product disposed of into the environment (Newman, 2000). The main sources of such wastes include: domestic and municipal; industrial; farming; and mining. Thus, the main contaminants found in water could include: detergents, pesticides, petroleum and its derivatives, toxic metals, fertilisers and other plant nutrients, oxygen-depleting compounds, polyaromatic hydrocarbons (PAH), nutrients, and disease-causing agents - that is pathogenic micro-organisms responsible for various infections of the body (Anton, 1993; Ellis and Mitchell, 2006).

Cities have a price to pay for urban water pollution in terms of water-related diseases which is a major cause of morbidity in the world. In developing countries, water related diseases are the main cause of mortality among children less than 5 years of age. Water-related diseases include those due to micro-organisms and chemicals in water that people are exposed to (WHO, 2006). These water related diseases (Ince, 1999) may be:

- water-borne caused by ingestion of water contaminated by human or animal faeces or urine containing pathogenic bacteria or viruses, for example faecal-oral diseases such as cholera, typhoid, amoebic dysentery and other diarrhoeal diseases;
- water-washed caused by lack of water (water quantity) and linked to poor hygiene (Trachoma, scabies);
- water-based caused through contact with water via aquatic invertebrate intermediate hosts (*Schistosomiasis*, *dranculiasis*);
- water-related insect vector (lymphatic filariasis)

Human activities constitute a major factor in urban water pollution. Further evidence from other parts of the world confirms this assertion. For example in China, of the various consequences in the changing environment, water contamination imposes a threat on China's society (Chen *et al.*, 2000). Over the past 40 years, nitrogen contamination has increased significantly in the Yangtze River (Chen *et al.* 2000; Liu *et al.* 2003), and the Han River has become one of its most nitrogen-contaminated tributaries (Liu *et al.*, 2003) in addition to its rich suspended sediments (Chen *et al.*, 2000; Gu *et al.* 2008) and slightly heavy metal contamination (Li *et al.* 2008).

In the urban context, the water quality of the Mukuvisi River in Harare was found to have been significantly affected by human activities, especially wastewater discharges (Zaranyika, 1997; Kamudyariwa, 2000; Moyo and Worster, 1997). The effects of pollution on human society, ecology and environment are great and the process of restoration is very expensive (Moyo, 1997; Naiman *et al.* 1998, Wolf 1998, Meyer *et al.*, 1999; Postel, 2000; Firth, 1998; Jackson *et al.*, 2001, Wilson and Carpenter 1999).

In the same vein, Ghana faces high levels of pollution in its water bodies especially in places where they are located near settlements, industrial (including mining) estates and agricultural activities (MWH, 1998). In Accra, Biney (1998), classified the main types of pollution reaching the Odaw-Korle catchment as: substances which increase biochemical oxygen demand (BOD) coming from domestic sewage, industrial effluents (industrial pollutants include substances such as trace metals, suspended solids, organic poisons and oil, pesticides, and nutrients), dump leachates, (liquids that are able to carry suspended solids through the soil) and urban run-off. Other sources of pollutants are

nutrients arising from domestic and agricultural activities. Other studies have corroborated the contaminated nature of the water of the Odaw-Korle River and provided some facts on the effect this has had on certain water dependent activities.

Amoah *et al.*, (2005) observed that irrigation water sources in Accra showed considerable variation in total and faecal coliform concentrations and the WHO guidelines (1000 faecal coliforms in every 100 millilitres of water) for unrestricted irrigation of crops likely to be eaten raw were exceeded in the majority of the cases for faecal coliform levels (WHO, 1989). This was attributed to the polluted nature of the irrigation water source since crops were contaminated, and in almost all cases, faecal coliform levels on the crops were more than 1000 for every 100g of lettuce (wet weight) and could be considered, according to the International Commission on Microbiological Specifications for Food (ICSMF) guidelines as “undesirable” (ICSMF, 1974, cited in Amoah *et al.*, 2005).

The health consequences of eating contaminated crops have not been fully studied in the population. *Ascaris lumbricoides* was the most predominant helminth (worm) species (kind) recorded in the water with population ranging between 2 and 4 individual eggs in one litre of water, exceeding the recommended level of < 1 individual egg in one litre of water for unrestricted irrigation (Amoah *et al.*, 2005; WHO, 1989).

Cornish *et al.*, (1999) equally recorded a range of 1-5 individual helminth (worm) eggs in one litre of water in both urban and peri-urban irrigation water sources including shallow wells. Irrigation with wastewater [that is the Odaw-Korle River] is a major source of contamination.

The above studies show that much still needs to be carried out in terms of detailed analysis of how interventions at the catchment level will allow urban farmers and communities to access improved quality water. Some work have been carried out on the technical scientific aspect of the pollution problem, as discussed above but much remains to be done in respect of analysing the interrelationships between the social and economic aspects of the pollution problems and how institutional interventions and programmes can help to address them.

An analysis of these interrelationships will be the strength of this study. This is why the study planned to investigate community members' criteria for assessing surface water quality; factors affecting water quality or causes of pollution; and the approach that must be adopted in influencing perceptions, attitudes, behaviours and practices which negatively affect surface water quality (these relate to objective two /research question two). In doing the analysis, the study recognised the tremendous influence of lack of decent sanitation and efficient solid waste collection services on surface water quality. This helps to explain further, the current polluted state of the surface water.

2.4. SANITATION AND WASTE MANAGEMENT

Improving sanitation is an important strategy to ensure health, social and economic development, and contribute to poverty reduction. There are linkages connecting poverty to poor sanitation and hygiene, since it is possible that scarce financial resources may be spent nursing the sick who actually contract disease due to poor sanitation practices (Maforah, 1994).

Sanitation coverage in Sub-Saharan Africa in the year 2006 was 31%; compared with 53% in the developing world; and 62% globally (UNICEF and WHO, 2008). In urban areas of Sub-Saharan Africa, every third person uses a shared sanitation facility. Eight out of ten users of an unimproved facility [pit latrines without slabs or platform] live in the rural areas. Open defecation is more of a rural practice; in developing regions, one out of three rural dwellers practice open defecation (UNICEF and WHO, 2008). However, in the city of Accra, a 'modified' version of open defecation is the wrapping and unauthorised disposal of human waste into water and the environment by individuals.

The majority of urban households in Ghana rely on public toilets and different types of unimproved toilets. Although the advent of private sector management of public toilets has led to general improvements, the situation is still unsatisfactory. In some cases, bucket toilets ("pan latrine") which were banned more than a decade ago, are still in use and tolerated by district assemblies because of the lack of decent alternatives (Larbi, 2006).

In Accra, three types of sanitation facilities are important - household toilets connected to on-site septic tanks; household bucket toilets (used extensively in the poorer areas);

and public toilets connected to septic tanks (located around the city with high numbers in poor or low income / low infrastructure provision areas) (Boot and Scott, 2008). Sanitation coverage in the city is 88%. However, since 60% of the population lives in low income settlements, most people use public toilets. Up to 5% of the population in the city (usually towards the centre) has a sewerage connection whereas the rest have on-site sanitation (septic tanks/latrines). Very few of the 22 sewerage treatment plants serving institutions and hotels in the city are functional (Akufo, 1998).

Emptying of the sanitation facilities in Accra occurs in one of two ways. Large vacuum trucks are used to empty the vast majority of septic tanks in the city. The alternative method that is also relied on is the manual emptying of bucket latrines into human waste beetle machines (improvised mechanised tricycles with a mini-rear tank) before it is sent to be discharged into underground holding tanks in some of the poorer areas of the city (Boot and Scott, 2008). What this means is that if there is a bucket latrine in use and no underground holding tank is available, people will look for unsustainable means of disposal.

Key challenges confronting urban sanitation relate to disposal practices, especially from on-site low cost facilities, which are often conducted in an unsanitary manner. It is through the presence and the operation of the illegal sector that faecal sludge reaches the immediate urban environment resulting in pollution of surface water bodies (Boot and Scott, 2008).

In Accra, about 1800 tons of Municipal Solid Waste (MSW) made up of household and market waste and 600m³ of human excreta are collected daily (Adamptey *et al.*, 2009). Up to 67% of the total MSW generated is collected and discharged in land fill sites with the remaining 33% left in the open environment (near riverbanks, in rivers, wastewater channels, roads, behind people's residence, and parks) (Lamptey and Abban, 1999).

In communities with low infrastructure provision and high density, where households cannot afford the cost of individual collection, the communities benefit from AMA funded solid waste collection services and no fees are supposed to be charged. There are also the informal solid waste collectors (several self-employed youths) who collect solid waste from individuals in such communities with the aid of push carts, for a fee, and dispose the solid waste usually at unauthorised places such as beaches, rivers, and

obscure places. In 1999, an estimated 13, 380 m³ of solid waste was collected by the informal sector (Lamprey and Abban, 1999). A survey of the composition of the solid waste in the city showed that the organic waste component formed the greater portion [55%] (Drechsel and Kunze, 2001).

It is evident from the above that practices in sanitation and solid waste management eventually affect the water quality of the Odaw-Korle River system and the environment. This is because there is lack of decent and environmentally friendly toilets and inefficient solid waste management practices. It was therefore important to investigate the extent of these sanitation and waste management problems from the community's perspective.

Efforts aimed at addressing urban water and environmental problems must consider the root causes. This can happen by adopting an integrated approach to problem solving. In relation to water and environmental quality, it was important to understand the motivations (factors) and explanations for people's perceptions, attitudes and behaviour. This was expected to support efforts aimed at responding to the problems in the city and the broader field of water and environmental management. This was against the backdrop that safe water quality will offer both livelihood opportunities and environmental services to the city and its peri-urban environments.

2.5. PERCEPTIONS, ATTITUDES AND BEHAVIOUR

The section begins with a discussion of perception and cognition. This is important because while people receive information from the environment to build their perceptions, processing of the information occurs through cognition which takes place within a particular social and economic context. Furthermore, since the study was to understand people's perceptions, attitudes and behaviour, it was important to discuss perception and relate it to how information is processed through cognition.

However, cognitive processes were not the focus of the study. The discussion on perception and cognition which follows, therefore serves as a bridge to the theory of planned behaviour which provides tools for studying people's perception (beliefs), attitudes and behaviour in a particular social context. The theory of planned behaviour is therefore discussed. The theory of planned behaviour assumes that people behave rationally and that they plan their actions before executing them. The theory of planned

behaviour is adapted for this study which adopts a sociological approach to study perceptions, attitudes, and behaviour, rather than the psychological approach (modelling) suggested by the theory. The adapted theory of planned behaviour is related to the Sustainable Livelihoods Framework because it seeks to generate knowledge that will help to protect natural capital (water and environment). The theory of planned behaviour is also linked to other views on perception, attitudes and behaviour to define how it was applied in this study.

2.5.1. Human perception of the environment and cognitive processes

Perception can be considered as the process through which an individual relates to the environment; that is the way in which information is received and interpreted (Murch, 1973). An individual experiences the environment as it is perceived and then tests the extent to which the perceived world reflects reality by interacting with the surroundings (Brunswik, 1956). Since individuals are only able to interact with aspects of the environment, the resulting perception is an estimation of the real environment (Cairns, 1981).

In Brunswik's (1956) terms, an individual who perceives, builds up expectations about the environment which are modified with experience. This is what he refers to as 'ecological validity' in his 'lens model' of perception. In this model, the environment sends out light, colour, smell and noise and this information is received by an individual and focused as a lens into a limited set of categories or concepts. The observer notes the focused information as the perceived world or environment. This model places people in an ecological relationship with the environment (Cairns, 1981). Some aspects of the environment may also have special meaning or significance (Ames, 1951). Therefore an individual samples and interprets the environment in a way that gives meaning to the individual (Cairns, 1981).

Although, the study focuses on the social aspects of perception, it is important to recognise one of the processes, called cognition, which helps an individual to interpret information from the environment to form a perception. Some of the processes involved in cognition include thinking, imagery, reasoning, problem-solving, memory, learning, and language (Montello, 1997; Kirsh, 2006).

One of the conceptual frameworks that help in understanding environmental cognition is by Golledge and Stimson (1987). The framework suggests that information from the environment is filtered because of personality, cultural, and cognitive variables to form two kinds of cognitive representations: images (that is pictures of objects which can be recalled to mind through the imagination) and schemata (that is the frameworks in which environmental information obtained from experience is organized). Walmsley and Lewis (1995) observed that the distinction between images and schemata, though important has been overlooked by writers; many have rather focused on the general activity of cognitive mapping. Cognition enables an individual to order reality (Turner, 1975). One of the first and key concepts developed to investigate and understand the mental representations (that is ordering reality) of an environment is the cognitive map (Argent and Walmsley, 2008). Cognitive mapping attempts to understand how an individual consciously, or otherwise, acquires, learns, develops, thinks about and stores information relating to environment, and the actual knowledge which is acquired (Downs and Stea, 1973; Jacobson and Kitchen, 1995; Kitchin, 1994; Ungar, 2000; Nova, 2005).

The perceptions an observer forms of the environment are determined not only by its physical attributes, but also by other factors such as: 1) The person's thinking processes, knowledge of the setting, and professional training or local knowledge; 2) The medium of presentation (or how the place is encountered, for example via a direct site visit, photograph, sketch, model, map, residence, among others); and 3). The mode of recording responses and observations (Craik, 1968; Lowenthal, 1972; Leff, *et al.*, 1974; Siegel, 1976).

Other views have also indicated that environmental perception and social conditions cannot easily be separated because they both determine how people perceive and use the environment (Broderick, 2007; White and Hunter, 2009). Environmental condition can have implications for work and identity (Trigger, 1999; Vanclay, 1999), a sense of place (Horwitz *et al.* 2001) and social capital (Pretty & Ward 2001). Social conditions can also impact on how the environment is perceived (Goodall, 2002).

What can be gleaned from the above is that there is an aspect of perception which involves people receiving information from their environment and using internal 'processors' to process this information to make meaning out of it. There are also

aspects of the environment which have special meaning to people in particular social and cultural settings (for example sacred lakes, sacred sections of a stream, sacred forest or groves). It is also recognised that several factors, both internal and external, affect the process of perception. It is these factors that determine and direct and modify people's perception over time.

Closely related to the process of perception and cognition are the framing conditions which influence perception. Goffman (1974) suggested an approach for studying visual images and cultural representations called 'frame analysis'. He suggested that cultures produce 'primary frameworks' (which can be likened to expectations in Brunswick's 'lens model'). These help to make meaning out of otherwise meaningless scenes by presenting a basis for comparison, or a conceptual structure through which people are able to interpret information. In his opinion, every culture generates two kinds of frameworks: natural frameworks and social frameworks. The natural frameworks are generated from completely physical experiences which people understand to be, from beginning to the end, driven by natural determinants, and therefore distinct from experiences which can be influenced by other factors. Social frameworks are generated by intelligent beings, such as humans.

In this vein, framing involves representation and meaning (Fisher, 1997). Benford, (1994: p1103) defined framing as the process through which '*ordinary people make sense of public issues*'. In Goffman's view (1974), all primary frameworks allow users to locate, perceive, identify and label an infinite number of occurrences relevant in the selected primary framework.

In the view of Gamson (1995), people think and communicate through images, which serve as reproductions and as a mental picture of things that either not real or present. According to Gamson (1995) cultures do not associate fixed meanings to images but people negotiate the image meaning (black substances in water or the environment may evoke different meanings in different environment); in his view people can frame and reframe. It can thus be said that perception and the meaning attached to them can change and be influenced. It is also noted that psychological factors, as discussed under cognition above, work together with the social aspects in influencing how people make meaning of their perceptions. Perception should not be separated from the social context in which meanings are generated. Perception will ultimately lead to people taking

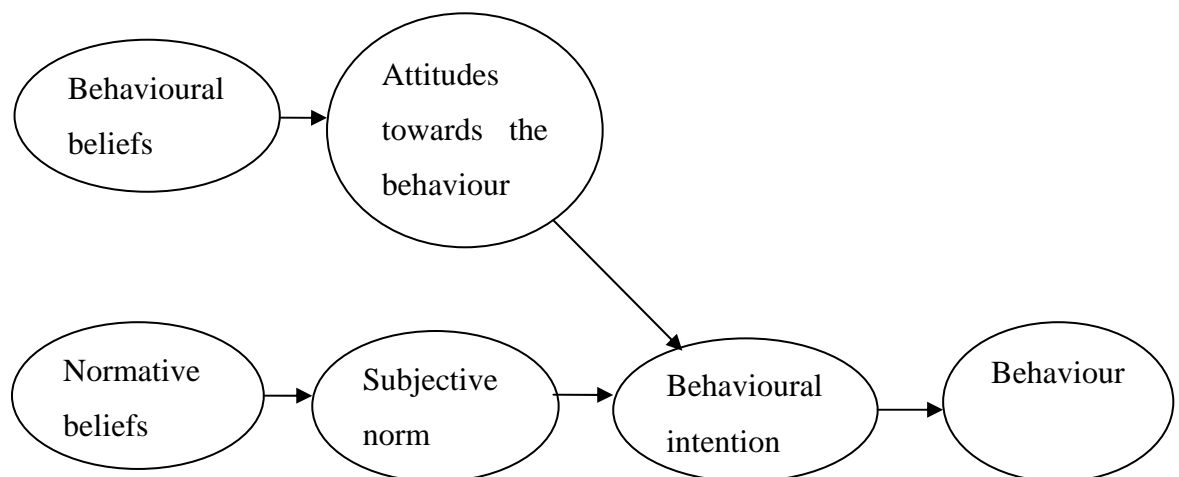
specific actions; their behaviour. Therefore it is important to understand how that context leads people to behave in a particular manner (in this case in relation to water and environmental pollution). The point is therefore made that this study is focused on the social and economic factors that help give meanings to people about their environment.

2.5.2 Understanding behavioural processes and relationship with perception

Pro-environmental behaviour (such as switching off lights, recycling and using sustainable modes of travel, and pollution prevention) has received much attention in recent academic literature as researchers attempt to understand the determinants of pro-environmental behaviour (Reid *et al.*, 2010).

Much research work (Schultz and Oskamp, 1996; Gatersleben *et al.*, 2002; Darnton, 2004; Jackson, 2005; Harland *et al.*, 2007; Reid *et al.*, 2010) which attempts to understand, explain and widen the scope of knowledge on the pro-environmental behaviour of individuals makes reference to the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1970; Fishbein and Ajzen, 1975; Figure 2.4 below), which was later refined as the Theory of Planned Behaviour (TPB) (Ajzen, 1985; 1991; Figure 2.5 below).

Figure 2.4. Theory of Reasoned Action (TRA)



Source: After Fishbein and Ajzen (1975).

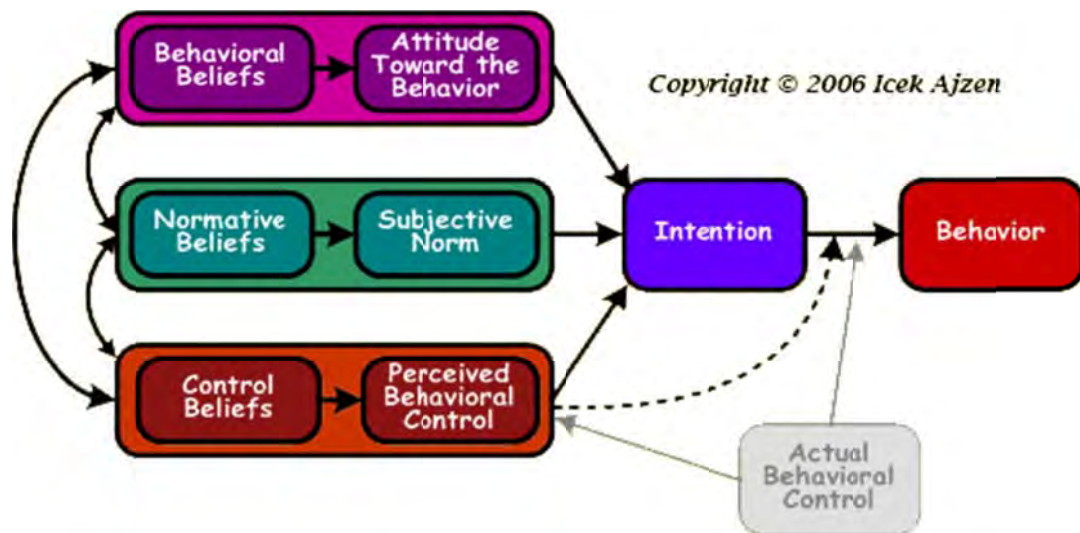
The Theory of Reasoned Action assumes that people behave in a rational or sensible manner in order to obtain favourable outcomes and meet the expectations of others. People think about the implications of their actions before they decide whether to

engage in the behaviour or not. According to this theory, behavioural intention is the immediate predictor of behaviour and is determined by attitude toward a behaviour and subjective norms.

The attitude to the behaviour is also influenced by the behavioural beliefs (perceptions). Behavioural beliefs are the likelihood that a particular behaviour will lead to a desired outcome. Subjective norms of approval or disapproval of the behaviour are held by specific individuals and are assumed to be a function of normative beliefs. Normative belief represents an individual's perception of what significant others will think about him/her performing the behaviour. In this case, the motivation (incentive) to comply depends on the tendency to act in a way consistent with the expectations of the reference group (Fishbein and Ajzen, 1975; Figure 2.4).

With further consideration of the TRA, and in an effort to respond to its limitation (it does not account for behaviour in which people have incomplete volitional control), Ajzen developed the TPB with the key difference being that the TPB accounts for 'perceived' in addition to 'actual' control over the behaviour in question (Ajzen, 1985; 1991). The introduction of perceived behavioural control was intended to allow the prediction of behaviours that are not under volitional control (Armitage and Conner, 2001).

Figure 2.5: Theory of planned behaviour



Source: Icek Ajzen, 2006, <http://www.people.umass.edu/aizen/tpb.diag.html#null-link>; retrieved 30th August, 2010.

Perceived behavioural control reflects (is a measure of) the extent to which people believe they are able to control the outcome of a behaviour (Burton, 2004). Relating to perceived behavioural control is the concept of ‘control beliefs’, which reflects an individual’s beliefs about the presence of factors that may help or make it difficult for the performance of the behaviour, and is also related to ideas of self-efficacy (Bandura, 1982; Bandura *et al.*, 1980; Ajzen, 2001; Reid, 2010).

Thus, a person’s behaviour is influenced by the confidence they have in their ability to perform it (for instance ease of access to solid waste disposal bins, availability of a house or public toilet). In addition, the control beliefs may be a consequence of past experiences (for instance whether there was any punishment for the previous pollution or there was a confrontation with a community leader, among others) and influenced by the experiences of important others (such as family, friends, neighbours) (Ajzen, 1991).

It is also noteworthy that perceived behavioural control may also have a corresponding (or direct) effect upon actual behaviour (without any behavioural intention: see Figure 2.5), particularly when the behaviour in question is perceived to be difficult to perform (for example, absence of an in-house toilet or public toilet and yet an individual is expected not to indulge in open defecation or wrapping and disposal of human waste) (Ajzen, 1991).

Some criticisms of the Theory of Planned Behaviour have suggested that it fails to consider emotional factors including threat, fear, and mood (Dutta-Bergman, 2005) and does not incorporate the contributions of past behaviour or habit, which are also important for understanding pro-environmental behaviour (Knussen *et al.*, 2004). Ajzen and Manstead (2007) attempted to defend the omission of these variables arguing that they are covered in the frame of behavioural and normative beliefs.

In spite of these limitations the ‘Theory of Reasoned Action and, in particular, the Theory of Planned Behaviour continues to dominate pro-environmental behaviour literatures’ (Reid *et al.*, 2010:315). Indeed, they have been used to attempt to understand behaviour in many studies (Boyce and Geller, 2001; Harland *et al.*, 2007; Lindenberg and Steg, 2007).

Perceived behavioural control has direct influence on behaviour, as indicated above. Thus, it was expected that the above theories will provide some underpinnings for the study and also help to draw conclusions from the study of people's perceptions, attitudes, and behaviour in the selected communities.

2.5.3 Predicting Behaviour: Intentions, Attitudes, Subjective Norms and Perceived Behavioural Control

Intentions reflect the driving factors which make behaviour possible or not. They show how much effort people are willing to make in order to perform the behaviour. If the behavioural intention is strong, it is more likely the individual can perform the behaviour. However, this is only possible if the person can perform the behaviour of their own free will (Ajzen, 1991), for example, taking decisions on where to dispose of solid waste. Though some behaviour may meet this condition, the achievement of most rests on the availability of needed facilities and resources (Ajzen, 1991), for example, time, money, skills, cooperation of others, availability of facilities such as sewerage systems, solid waste collection bins etc. These constitute people's actual control in relation to the behaviour (Ajzen, 1991). An example will be a situation where an individual can decide (intention or motivation) to either use the public toilet or indulge in open defecation, but where ability to pay serves as the actual control in deciding on a particular behaviour.

According to the theory of planned behaviour, there are three independent determinants of intention. The first is the attitude to the behaviour, explained as the extent to which an individual is favourable or unfavourable to a behaviour (or object of the behaviour). The second determinant is a social factor called the subjective norm which is explained as the perceived social influence on demonstrating a particular behaviour, or not. The third determinant of intentions is the extent of perceived behavioural control, explained as the perceived ease or difficulty in demonstrating the behaviour and may be influenced by past experience or anticipated obstacles (Ajzen, 1991).

The stronger the attitude and the subjective norm, the stronger should be the intention to perform the behaviour. The relative significance of attitude, subjective norm, and perceived behavioural control in predicting intention will vary across different behaviour and situations. Thus, in some situations, only attitudes may have a significant impact on intentions; in others attitudes and perceived behavioural control may be

enough to account for intentions and in some cases, all three predictors may make independent contributions (Ajzen, 1991). Therefore, relating it to the study, in one community, perceived behavioural control may be sufficient to predict whether people will pollute or not; in another community it may be that attitude and subjective norm will make independent contributions and yet in others, all three have to make independent contributions.

In line with the theory of planned behaviour (Figure 2.5), attitudes form from people's beliefs about the object of the attitude. Beliefs are usually formed about an object as people associate it with particular features, characteristics, events, or even other objects [this is part of the process of cognition which is discussed above in section 2.5.1]. Usually the characteristics or features which come to be associated with the behaviour are already valued positively or negatively (such as associating surface water with solid waste, human waste, industrial waste, petroleum waste, fisheries, among others). This results in an individual also developing an attitude towards the behaviour (Ajzen, 1991).

Relationship between perception, attitudes, and behaviour

From the above therefore, it can be said that perception (from beliefs) influences the attitudes of individuals, and attitudes influences the behaviour of individuals. Therefore, it is important that a more complete approach to study pro-environmental behaviour considers the social context within which the people's perception, attitudes and behaviour take place, because that will help to interpret behaviour in context (Oreg and Katz-Gerro, 2006). In the same vein, Stern *et al.*, (1995) emphasised the need to consider the social structures which shape individuals' experiences and their personal values, beliefs, and behaviours.

According to Oreg and Katz-Gerro (2006; p. 465):

'the hierarchical model presented by Stern et al. (1995) extends Ajzen's (1985, 1991) models, and although the authors adopt the notion that attitudes guide intentions, which in turn guide behavior, they also suggest that individuals' worldviews precede their attitudes, that their personal values precede their worldviews, and that their position within the social structure precedes their values' (i.e., position -> values -> worldviews -> attitudes -> intentions -> behaviour).

Value in this case shows how individual preferences place one thing before or above the other because of a view that it is better (Brown, 1984; Bozionelos and Bennet, 1999).

Environmental attitudes and behaviour change

Attitude change may correspond with behaviour change associated with compliance with legislation (e.g. such as penalties imposed for polluting: Downing and Ballantyne, 2007). Attitudes and behaviour change are likely to be shaped and constrained by the social, economic, political, and technological environment (Upham *et al.*, 2009). The relationship between attitudes and behaviour is therefore not linear, since several factors determine the specific actions individuals take into account to achieve their objectives (Jackson, 2005; Upham *et al.*, 2009). Indeed the theory of planned behaviour, discussed above, supports the fact that there is no linear relationship between attitude and behaviour because of the socio-economic factors.

Long-term behaviour maintenance has been a problem for behaviouralists focusing on environmental problems and issues, and may be one of the reasons why behavioural interventions (interventions aimed at influencing or changing a particular behaviour) and their applications are yet to realise significant uptake (Lehman and Geller, 2004). To deal with this problem, Lehman and Geller (2004:24) proposed three solutions:

'(a) focus on behaviours that do not need to be maintained, (b) implement intervention evaluations of appropriate length and design so that factors which increase response maintenance can be discovered, and (c) design interventions that can continue indefinitely. One way to do this is through environmental design'.

The process of perception and cognition, the theory of reasoned action and planned behaviour, indicate that it is possible to understand people's actions by investigating how information gleaned from the environment is interpreted (perception formation) and how this is modified with time or under different circumstances and in turn influence attitudes with possible effect on behavioural intentions and/or actual behaviour within a particular socio-economic context.

This sets the context for the study. The theory of reasoned action and planned behaviour provide the theoretical background for understanding the relationship between attitudes and behaviour rather than following through the more psychologically (or cognitive) driven quantitative predictive measurements suggested by the theory to evaluate people's attitude and predict behaviour.

The notion of perception, attitudes, and behaviour implies that such a study should be carried out with an understanding of the socio-economic or cultural context of the

participants; in particular, how people are using their local knowledge and understanding of their social context to explain their own or others perceptions, attitudes and behaviour.

The sociospatial dialectic

The inter-relationships existing between people and their physical and social environments serve as the foundation for the study of the urban environment. People create urban spaces, and these spaces also draw their character from (or are shaped by) the people who live in them. People who live in urban spaces progressively impose themselves on the environment and in the process transform and shape it as much as possible in order to meet their needs and express their values. At the same time, people themselves slowly adjust both to their physical environment and the people around them. Therefore one can observe a two-way continuous process, a socio-spatial dialectic, in which people create and transform urban spaces while at the same time they are conditioned in different forms by the spaces in which they live and work (Knox and Pinch, 2000).

Where people live, such as neighbourhoods and communities, are created, preserved and transformed; the values, attitudes and behaviour of their inhabitants are shaped by the surroundings and also the values, attitudes and behaviour of their neighbours. Therefore urbanization creates a context of change in which there is a continuous interaction of the social, economic, demographic and cultural forces (Knox and Pinch, 2000).

Dear and Wolch (1989) as cited in Knox and Pinch (2000: 8-9) recognize three key components to the sociospatial dialectic, describing instances where:

- *social relations are constituted through space, as when site characteristics influence the arrangements for settlement.*
- *social relations are constituted by space, such as the inertia imposed by obsolete built environment, or the degree to which the physical environment facilitates or hinders human activity.*
- *social relation are mediated by space, as when the general action of the 'friction of distance' facilitates the development of a wide variety of social practices, including patterns of everyday life. (the notion of friction of distance is based on the idea that as the distance from a point increases, interaction with that point decreases, usually because of the time and cost involved)*

Thus, social processes occur in space and explanations of these must factor in the spatial dimensions which are shaped by people and in turn also shape what people can or cannot do.

Attribution and Social Knowledge

It is important in such a study of perceptions, attitudes and behaviour to understand the explanations people offer for people's attitudes and behaviour in the study area. Such understanding will more likely lead to more options on how to respond to the problem of pollution in the study area.

'People construct explanations for both physical phenomena (e.g. the earth quake, climate change, floods) and human behaviour (e.g. anger, particular attitude, behaviour leading to pollution) and in general such explanations are causal explanations, in which specific conditions are attributed a causal role' (Hogg and Vaughan, 2005:82).

'Social psychological theories of causal inference are referred to as attribution. Attribution theories are primarily involved with the process through which people make dispositional or situational attributions for their own and other's behaviour. Another attribution context is intergroup interactions in which individuals as group members make attributions for the behaviour of themselves as in-group members and also for others as out-group members' (Hogg and Vaughan, 2005:100).

In intergroup attributions, there is in-group-serving bias. This implies that all things being equal, people who see themselves as part of a group will always make themselves look good in other's eyes whereas people who are perceived as not part of that group are projected as bad people (Hewstone and Jaspars, 1982; Hewstone, 1989, 1990; Pettigrew (1979). A typical example could be a place noted for pollution and yet its inhabitants attribute it to the activities of some external people.

People rely on a stock of acquired and richly textured cultural knowledge that appears naturally to offer explanations on what is happening around them. This knowledge is embedded in cultural beliefs, social stereotypes, collective ideologies and social representation (Hogg and Vaughan, 2005). For the purposes of this study, emphasis is placed on social representation which is relevant at this stage.

Moscovici's theory of social representation describes one way in which cultural or social knowledge relating to the causes of things may be constructed and transmitted (Farr and Moscovici, 1984; Lorenzi-Cioldi and Clemence, 2001; Moscovici, 1981, 1988). Moscovici held the opinion that people's beliefs (perception) are socially constructed. In other words, their ideas and opinions are shaped by what other people

believe and say. It is from this point that the individual's perceptions, attitudes, and behaviour are shared with other member's of one's community (Hogg and Vaughan, 2005):

'Our reactions to events, our responses to stimuli, are related to a given definition, common to all members of the community to which we belong' (Moscovici, 1983:5; cited in Hogg and Vaughan, 2005).

In this vein, attitude can be considered socially constructed and is inclined to reflect the society in which people live their lives. This presupposes that people draw on local knowledge, opinions, views and how things are generally perceived in their locality or society to situate their own attitudes.

Social representation is a situation where group members share some consensual understanding between them. These emerge from informal daily communication and interaction. They transform the unfamiliar and complex phenomenon in the community into forms that provide a common-sense framework which people apply to interpret their experiences (Hogg and Vaughan, 2005).

In the view of Parker (1987:448):

'Social representations are the shared images and concepts through which we organise our world. Since people in any one society do inhabit a wide variety of different social worlds, they employ different vocabularies to warrant their actions. Different social representations are drawn upon in different situations to accomplish and to display identifications with different groups'.

Though the theory of social representation has been criticised often for the imprecise way that it is formulated (Augoustinos and Innes, 1990; Potter and Litton, 1985; Parker, 1987), it still provides an avenue through which ordinary social interaction in people's locality or society constructs rational or naive causal relationships that are relevant for explaining circumstances (Heider, 1958).

'To understand the 'social representations' employed by a community-or a group, sub-community or culture, or a social world-is to understand the forms of thought of that world' (Parker, 1987: 449).

Since social representations tend to be embedded in groups, they vary from group to group. In this vein, intergroup behaviour may sometimes revolve around a conflict of social representations (Lorenzi-Cioldi and Clémence, 2001). Social representation can

be said to relate also to the 'framing' process discussed above, since both are means of making complex scenes and situations simple for its members to derive meaning. However, social representation places emphasis on the fact that group social representations influence individual perceptions, attitudes, and behaviour.

The literature above indicates the need to establish a sound understanding of the socio-economic or cultural setting of the study group. More importantly, how people's knowledge, expressions of thought, perceptions, attitudes, and behaviour are influenced by the socio-cultural context. Furthermore, it is also important to understand people's attributions for behaviour in their locality. This is expected to provide a perspective that will deepen understanding of what is happening within the study group.

From the literature presented above, there are many processes involved before the actual behaviour of people can be properly understood. However, for the purposes of this research, first there was a proposed analysis of people's perception of surface water (river), environmental beliefs and environmental quality and this was followed up with a detailed investigation into the attitudes of people towards behaviour and issues relating to the water and environmental pollution. The predicted behaviour from the investigation (from the analysis of attitudes statements) was compared with the observed behaviour (both observed in the field and discussed in focus group discussions).

Furthermore, as it was indicated in the discussion on the Sustainable Livelihoods Framework, a study of perceptions, attitudes, and behaviour, relates to ensuring improvements in natural capital (water and environment). This aspect also relates to the social capital of people, because the community social capital can help in interventions to control or worsen pollution. It relates to financial capital because people with the ability to afford services, for example, solid waste collection, may not go and pollute. Though, by itself, the Sustainable Livelihoods Framework does not provide sufficient tools for studying people's perceptions, attitudes, and behaviour, some complementary relationships, as mentioned above, exist between these theoretical perspectives on perceptions, attitudes, and behaviour and the Sustainable Livelihoods Framework.

This section presented some theoretical bases for examining perceptions, attitudes and behaviour. It discussed perception and cognition and indicated that cognition enables

individuals to process information received from the environment. This was related to the theories of reasoned action and planned behaviour where three independent predictors of behaviour: attitudes, subjective norms and perceived behavioural control were discussed. It was established that perception can influence the attitudes of people. The discussion emphasised that the study of perceptions, attitudes, and behaviour should be related to the social and economic context of the group involved in the study. Thus, such a study must adopt an integrated approach.

2.6. INTEGRATED URBAN WATER MANAGEMENT

The discussion in this section shows that integrating local participation in water and environmental management can complement city authority efforts. Thus, various views are explored on stakeholder participation in water and environmental management. There are several benefits from involving all the relevant stakeholders in water and environmental management (for example, reduced conflicts about decisions; opportunities to understand stakeholders and to include issues which may have been ignored by only one stakeholder; improvement in the acceptance of decisions, among others). This warrants investigation and understanding of the organisational, policy and institutional setting in order to ascertain how collaboration can promote integrated water and environmental management; these are discussed below. The concept of community participation makes it possible for communities to use several techniques and tools to express their views and through this process influence decisions and actions in relation to governance, economic, management, and planning. In this vein, participation could come from the administrative point of view or from initiatives from active citizen participation. In both ways, there may be particular interests that need attention. Community participation therefore has good prospect of enhancing formal decision making processes and helping to draw the attention of policy and decision makers to the most urgent needs in the community.

2.6.1 Local participation in resource management

Effective river basin level institutions are most successfully built on the strong foundations of local institutions (Merry *et al.*, 2004). This will usually take a long time to occur, it is therefore important to have a forum where different stakeholder interests would be represented (Moench *et al.*, 2003, cited in Merry *et al.*, 2004). In order to address specific behaviour which leads to water and environmental pollution, there is

the need for good water and environmental governance. The scope of water governance covers the range of:

‘political, social, economic, and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society’ (Black and Hall, 2004; page 11).

These may include measures at the national, city, and community levels to respond to specific needs. Good governance depends not only on effective and transparent government, but also on active citizenship (in terms of rights and responsibilities). In order to achieve good governance over water resources and systems in poorer countries it is important to:

‘strengthen the ability and capacity of the people, particularly poor women, men and children and their advocates;

- *‘to participate meaningfully and advocate effectively their interests in the process of decision–making over water,*
- *to hold decision makers to account for decisions that trample on or present a barrier to their achievement of water security, and*
- *to gain redress for their grievances’ (Calaguas and Frances, 2004: 22)*

The process of Integrated Water Resources Management (IWRM) suggests the participation of civil society and community based organizations to educate and empower people. Citizen responsibility in relation to access to water varies from country to country, but it has been argued that the involvement of communities or citizens in water and environmental management can be beneficial by instilling a sense of ownership. Thus, IWRM will ensure citizen involvement in water and environmental management (Calaguas and Frances, 2004).

Local knowledge is also important for environmental management. It is important therefore to develop local capacity to shape present and future sustainable ecological management (Rockstrom *et al.*, 2004). There is evidence that in many regions people develop methods to adapt to changes in the social–ecological systems (Berkes *et al.*, 2003). Local social capacity building can lead to local social mechanisms to control ecological challenges, ensure social and institutional learning as well as stakeholder involvement in resource management (King and Louw, 1998; Gunderson *et al.*, 1995). The management of social-ecological systems needs to be adaptive, that is able to cope with uncertainty and complexity (Holling, 1978). Adaptive management is built on:

'recognition that ecosystems are complex, "adaptive" and "self organizing" systems, and that in order to apply such systems sustainably, society must have the capacity to adapt to change or surprise in them' (Rockstrom et al., 2004:1116).

Local knowledge can also be supported with scientific experimental knowledge (Olsson *et al.*, 2004). Sectoral water and environmental management efforts have not achieved a significant breakthrough in responding to problems of urban water and environmental management, for example, the Korle Lagoon Ecological Restoration Project (KLERP) which started in the year 2000 (Accra, Ghana). An intersectoral approach to the KLERP would have indicated that it is not appropriate to attempt to restore a polluted natural ecosystem downstream without measures to address the problem at different sections of the Odaw River, which eventually flows into the Korle Lagoon [prior to river diversion into the sea] (Abraham *et al.*, 2006).

There are avenues (such as the existing arrangements in the communities to respond to water and its environmental problems and the currently existing stakeholder platforms) for the city authority, communities and other relevant organisations to become partners and respond to current problems in the water and environment sectors. This calls for understanding the unique roles and expertise that different organisations can contribute to problem solving. This also strengthens the basis for encouraging the participation of stakeholders; such as organisations in the water and environment sectors, communities, households, individuals, civil society organisations, and non-governmental organisations, in water and environmental management.

2.6.2. Basis for a Stakeholder Participation Approach

This section presents some arguments for and against adopting a stakeholder approach to water and environmental management. According to Reed (2008), perspectives on stakeholder participation have evolved: from awareness creation in the late 1960s (the anti-modernisation technology paradigm); including local perspectives in data acquisition and planning in the 1970s; the development of methods which emphasised local knowledge and the need to ensure that local stakeholders lead the way such as in farming systems research and rapid rural appraisal in the 1980s. Participation also became more commonly accepted as a norm in development practice in the sustainable development agenda of the 1990s. This was followed with a critique of participation and associated problems because it failed to achieve what was anticipated by its patrons. In

the post-participation era, people are learning from the mistakes and successes of this long history.

Participation has evolved with ideological, social, political and methodological meaning, resulting in a wide range of interpretations. Several typologies of participation have been developed out of this evolution and can be applied differently to involve stakeholders (Reed, 2008).

Participation can also be in relation to the degree of stakeholder engagement. Arnstein's (1969) 'ladder of participation' described a range of stakeholder involvement (Manipulation, Therapy, Informing, Consultation, Placation, Partnership, Designated power, and Citizen control), with the two ends being: passive dissemination of information or just education (which she termed 'manipulation') and active engagement or citizens actually assuming key responsibilities in the stakeholder engagement ('citizen control'). Many alternative descriptions have been proposed for the different rungs of this ladder. One which is commonly known and used is Bigg's (1989), which categorises the extent of engagement or participation in the form of a relationship which may be 'contractual', 'consultative', 'collaborative' and 'collegiate'.

According to Farrington (1998), participation could be 'consultative', 'functional' (that is local involvement and use of local capacity, knowledge etc. in project management - an example could also be initiatives by communities to respond to specific water and environmental problems), or 'empowering' (such as building capacity and creating opportunities for stakeholders). Lawrence (2006) developed this further, suggesting 'transformative' participation as an alternative top rung of the ladder. In this vein, empowerment has to result in the transformation of the relevant stakeholders (organisations and communities).

Other considerations looked at the nature instead of the degree of participation with emphasis on some types of public engagement and the direction of communication (Rowe and Frewer, 2000): information dissemination to passive recipients is in the frame of 'communication'; collating information from participants is the frame of 'consultation', and 'participation' is considered as a two-way communication between stakeholders.

Participation could also be ‘research-driven’ or ‘development-driven’ (Okali *et al.*, 1994) whereas Michener (1998) contrasted ‘planner-centred’ participation which is outcome oriented with ‘people-centred’ participation, which develops capacity and empowers stakeholders to identify and work towards their own needs.

Different levels of engagement are likely to be appropriate in different contexts, depending on the objectives of the work and the capacity for stakeholders to influence outcomes. Thus, the idea of involving several communities and stakeholders in the study was to ensure participation (focus group discussions, interviews), consultation (such as informing key people in communities about the work being done), collaboration (to think through existing problems to see how best they could be addressed) and eventual empowerment (primarily through knowledge exchanged in the discussions and the implementation of the results of the study) that will encourage organisations to do things differently.

Community involvement in decision making in Accra

The local government laws mandate the Metropolitan, Municipal, and District Assemblies (MMDAs) to involve the local communities in decision making. However, the implementation of this law is problematic as interactions in the field showed that it is yet to be fully operationalised by the MMDAs. If this is executed, it will allow collaboration between the city and the communities. Furthermore, each community is supposed to have a unit committee to liaise with the MMDAs, but this is also yet to function. Thus there is a need for more innovative approaches to mobilise communities in decision making processes in the city. The above strengthens the decision to engage with relevant organisations and communities in the study. The processes of consultation and participation at different levels was expected to encourage the exchange of relevant ideas and information which will be useful for understanding the water and environment problems and how to proceed in addressing them. The decision to engage with stakeholders was also strengthened by the perceived benefits of stakeholder participation.

2.6.3 Benefits of Stakeholder Participation

Suggested benefits of stakeholder participation in programme implementation and interventions have encouraged its incorporation into national and international policy

(Reed, 2008). Active stakeholder participation can help address concerns over exclusion and encourage more relevant stakeholders to be involved in decisions that affect them. In this vein, active citizenship can be promoted.

Furthermore, it may also increase public trust in decisions and civil society, if participatory processes are perceived to be transparent and consider different interests (Patel *et al.*, 2007; Abers, 2007). Stakeholder participation can empower stakeholders through participatory generation of knowledge, and increasing participants' capacity to apply this knowledge. It may also increase the likelihood that water and environmental management decisions are perceived to be holistic and fair (Sandstrom and Mark, 2007; Wells, 2008). Participatory processes should lead to higher quality decisions, as they can be based on more complete information which anticipates and responds to unexpected negative outcomes before they occur (Martin and Sherington, 1997).

In a review of water and sanitation projects in Africa, Asia, and South America, Visscher *et al.*, (1999) observed that all case studies indicated that stakeholders were involved at some level of decision making in water resources management or in the planning and operation and maintenance of the water supply systems, but the actual levels of involvement and the prolongation of the interest in the programme were often limited.

In relation to farming within cities, multistakeholder approaches have been used extensively in several cities within the Resource Centre for Urban Agriculture and Food Security-Cities Farming for the Future] RUAF-CFF programme. As a result of these processes, policy changes have taken place within these cities to promote urban and peri-urban agriculture (UPA) and its associated livelihoods. Multistakeholder processes (MSP) contributed to building participatory and democratic governance (in the cities and institutions involved) and facilitated change. The MSP are based on the principles of participation, ownership, commitment, mutual trust and collaboration (in planning and decision making). The various reports on the successes of the RUAF-CFF project can be accessed at the RUAF, website (www.ruaf.org).

The EU funded Sustainable Water Management Improves Tomorrow's Cities Health (SWITCH) project, started in 2005 and ended in 2011. As a global project, it adopted extensive and comprehensive stakeholder participation at all levels in the cities which

participated in the project. Through its Learning Alliance model in cities, stakeholders were encouraged to share ideas and learn on the platform. It is an important case of what stakeholder participation can achieve from the global to the local level. Through the SWITCH project activities, cities have effected changes in their water management systems to adapt for the future. The various reports are available on the website (<http://www.switchurbanwater.eu/>).

In general the quality of a decision is strongly dependent on the quality of the process that leads to it. On the other hand, stakeholder participation may have some limitations because consultation fatigue may occur as participants realize that their involvement obtains for them little (personal) reward (for example, some people who initially agreed to participate in focus group discussions rescinded their decisions when they realised that there was no immediate material reward for them) or capacity to influence decisions that affect them.

In this investigation, stakeholder involvement was to encourage participation in issues relating to water and its environmental management. The process of involving communities, key informants and organisations in this research created the opportunity for grounding the possible conclusions and recommendation or knowledge in the appropriate local and organisational context. The interest generated by engaging with people in communities could set in motion innovations in relation to water and environmental management. Understanding stakeholder needs is important for future intervention. This was particularly important for the study since it focused on community members and organizations in the water and environment sectors. This called for appropriate methods for engaging and understanding stakeholders.

2.6.4. Stakeholder Analysis

This section reviews some of the approaches for understanding stakeholders pertinent to this study, highlighting some concepts in stakeholder engagement for the urban water and environmental management process. Grimble (1998:1) defines stakeholder analysis as:

'a methodology for gaining an understanding of a system, by means of identifying the key stakeholders and assessing their respective interests'.

Schmeer (2000: 3) defined it as:

'a process of systematically gathering and analyzing qualitative information to determine whose interests should be taken into account when developing and /or implementing a policy or programme' .

'Stakeholder analysis recognizes the different interest groups involved in a particular process and provides tools that help to identify and resolve trade-offs and conflicts of interest' (Grimble, 1998:1).

Schmeer's view that it should be a systematic process is laudable. Similar to Grimble, Schmeer also emphasises considering groups or stakeholders whose interests should be taken into consideration. This implies that there will be some groups who will not be involved in a particular development because the analysis may not consider their interests as key. This warrants caution in stakeholder analysis because wrong classification of stakeholders will lead to problems.

Stakeholder analysis helps to understand whose interest should be taken into consideration and why, when making decisions in project implementation (Crosby, 1991).

Who are stakeholders?

Chevalier (2001:2) defined them as:

'groups, constituencies, social actors, or institutions of any size or aggregation that act at various levels (domestic, local, regional, national, international, private and public), have a significant and specific stake in a given resources, and can affect or be affected by resource management problems or interventions'.

Schmeer (2000:1) has defined stakeholders as:

'actors (persons or organizations) with a vested interest in a policy being promoted'.

Key stakeholders in urban water and environmental management will include regulators, policy making and implementing organisations, departments in charge of facility development and maintenance, planners and administrators in government, and commercial bodies or non-governmental organizations, communities, residents' groups, among others. A fundamental distinction between stakeholders is likely to be those who affect (determine) a decision or action-and those who are affected (positively or negatively). It should be noted however that there may be cases in which some local individuals may be involved both actively and passively. It is important that the purpose

for analyzing the identified stakeholders is also clearly defined so that appropriate methods can be selected for the analysis.

Approaches to stakeholder analysis

Though there are several ways of carrying out a stakeholder analysis, flexibility and thinking through are essential, and the steps may include (Schmeer, 2001):

- clarification of the objectives of the analysis;
- placing issues in a system context;
- identification of decision-makers and other stakeholders;
- investigation of stakeholder interest and agendas; and
- investigation of patterns of interaction and dependencies (conflicts and compatibilities, trade-offs and synergies).

The study intended to address the gaps in the research carried out on water and environmental management, by examining the contributions of key organizations to the water and environmental management in the city, in terms of their capacity to ensure efficiency and effectiveness (thus correctly identify needs and respond to them in policy and practice). This allowed analysis of possible linkages in relation to how organisations and community participation and collaboration in water and environmental management in the city can promote ownership among people and improvement in water and environmental management. There are several levels of participation in Accra and therefore understanding the level to engage with stakeholders at any point in time will be important for results in programme implementations and interventions. In the study, after identifying key stakeholders, relevant tools were applied to analyse and map key strengths, weaknesses, linkages and areas of potential conflict (Matsaert, 2002). One group of stakeholders is the organisations and since organisations implement processes and institutions, it was important to discuss organisations and institutions together (see the Sustainable Livelihoods Framework; section 2.1.4). This is the rationale for the discussion on institutional analysis below.

2.6.5. Institutional Analysis

Institutions comprise both formal and informal rules, particular norms which influence human interaction by constraints, incentives and enhancement. These human

interactions occur between individuals, within organizations, and between organizations (Mathauer, 2004).

‘Institutions can also be defined as organizations or sets of conventions, policies or legislation which regularize social behaviour. Institutional analysis is an analytical approach that uses qualitative methods to understand decision-making and implementation processes’ (Matsaert, 2002:2).

Institutions influence the actions of both individuals and organisations and therefore affect their functioning and performance (Mathauer, 2004).

Organizations are social systems that have been actively created to follow and achieve a particular goal. They consist of groups of individuals that are formally organized for a specific purpose (with both structure and function; such as the Public Utilities Regulatory Commission, Environmental Protection Agency, and Water Resources Commission etc.) and its members affect and are affected by the existing rules (Mathauer, 2004). Thus, they reflect both formal and informal institutions (see Box 2.1). For example, an organization’s internal rules will comprise personnel management, budgets, communication, procurement, capacity development, and reporting procedures, and therefore influence the conduct of their members (Burki and Perry, 1998). Institutions as formal and informal rules are situated within an organisational context.

Box 2.1: Formal versus informal institutions

‘Organizations and individuals pursue their interest within an institutional framework defined by *formal rules* (e.g., constitutions, laws, regulations, contracts) and *informal rules* (e.g. ethics, trust, religious precepts, and other implicit codes of conduct). Compliance with these norms and rules of behaviour is ensured through incentives and sanctions. Additional focus needs to be given to specific patterns of *informal institutions*, which constitute social order and (political) culture, in which organizations are embedded, whereby informal institutions may support or subvert formal institutions within a given context. Informal institutions have thus a major effect on how an organization functions. Informal rules are usually much harder to modify than formal ones. They have a tendency to be deeply embedded in the players’ cultural repertoires. But changing formal rules may also be difficult, when it calls for legislative changes’.

Source: Mathaur, 2004: 9

Institutions are important for development because they influence the quality of policy making and the performance of organisations (public, private, voluntary) (Mathauer, 2004). Methods which may be useful for institutional analysis include:

- key informant interviews;
- time lines developed in group discussions showing key changes and impacts;
- Literature review (government institutions, lobby groups, user groups, e.g. farmer's unions may be able to provide relevant information, website, annual reports etc) (Matsaert, 2002: 5).

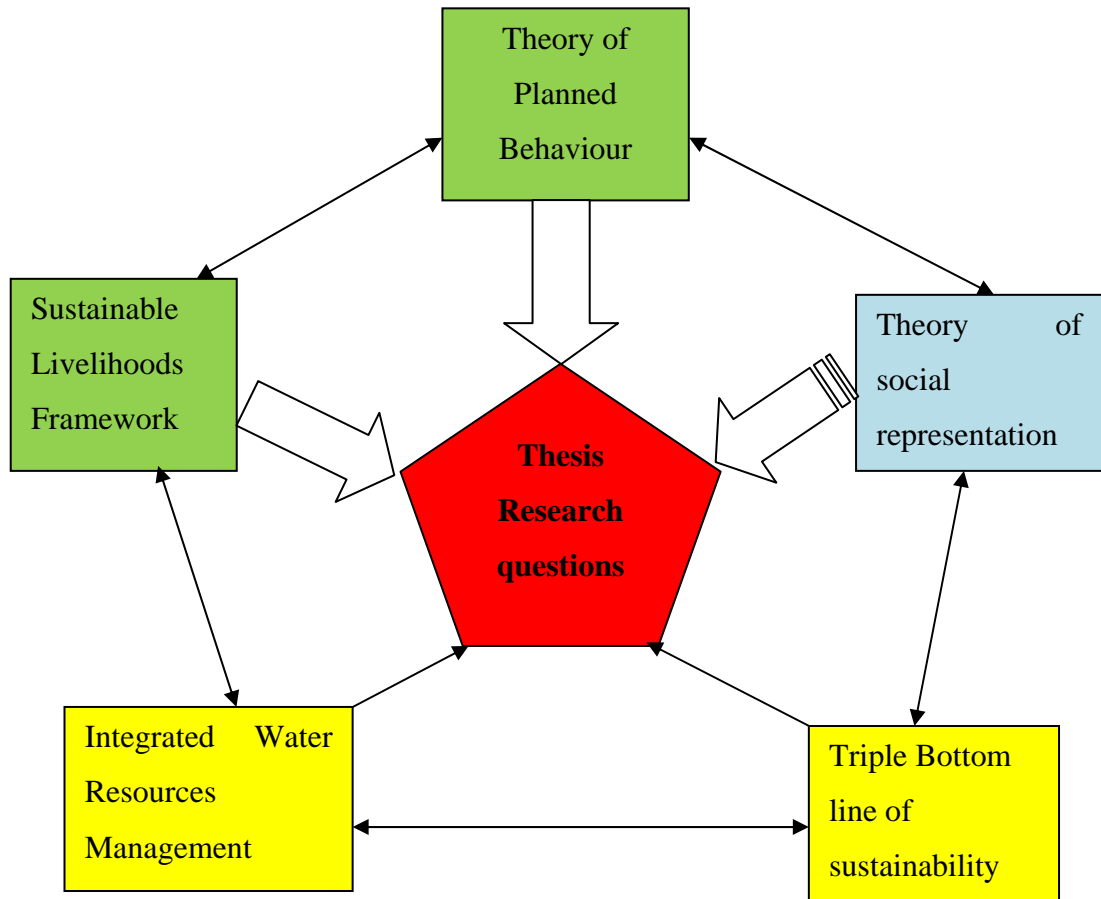
In the context of this study, institutional analysis was intended to help identify institutional issues (capacity in this case) for the urban water and environment sectors which would help to suggest possible innovations in water and other environmental interventions. The organisational capacity and institutional issues were important for linking with the key issues emerging from the livelihoods and perceptions, attitudes, and behaviour components of the study.

2.7 CONCEPTUAL FRAMEWORK

The conceptual framework (Figure 2.6) was developed from the key theoretical perspectives; Sustainable Livelihoods Framework, Triple Bottom Line of sustainability, Theory of Planned Behaviour, Theory of Social Representation, and Integrated Water Resources Management (IWRM)] which have been presented in in this chapter. The conceptual framework will therefore form the backbone for responding to the research questions presented in chapter one through the methodology of the study presented in chapter three. It is also the basis for explanations of the results and the analyses presented in chapters four, five, six, and seven.

The Sustainable Livelihoods Framework (SLF) offers tools for a people centred approach to livelihood studies, with the ultimate aim of reducing poverty. It does so by considering people's assets in five different forms (section 2.1). The SLF shows how people's assets can be analyzed by taking into account the factors which undermine the people's socio-economic progress and thereby make them vulnerable (such as seasonality, trends, and natural disasters). People's assets acquisition and ability to convert from one form to other forms are determined by the prevailing policy and institutional environment and therefore it is important for studies which seek to recommend measures to support the poor and the vulnerable.

Figure 2.6: Conceptual Framework



Legend:

- Green Key concepts
- Light blue: Supporting concept
- Yellow Background or informing concepts
- Links key explanatory concepts to research questions:
- Links supporting concept to research questions:
- Links background or informing concepts to research questions:
- Linkages between concepts:

The SLF is further supported by the triple bottom line principle (TBL) of sustainability which adopts a three prong approach to development – people (social), planet (environment) and profit (economic) (section 2.2.3; Figure 2.3) (Figure 2.6). The anchor of this principle suggests that a balance be ensured between the dividends from any development and the impacts it has on people and the environment. This is in line with the SLF which suggests that policies and institutions that are designed to help people improve on their asset base must not in any way undermine the environment (natural and built) upon which people depend for their livelihoods. The TBL approach suggests

that organizations that are involved in explorations of any form of resources must do it in such a way that it is environmentally friendly, economically viable and yet promotes the livelihoods of people rather than undermine people's quest for improved livelihoods.

Both the SLF and the TBL support efforts and policies that will enable people to make the best of their environments and thereby improve their livelihood outcomes, (improved income, reduced poverty, good health and sound mind, food security etc.). Therefore the selection of the SLF and the TBL principle was strategic to guide the study into the livelihoods of people and how systems can be put in place to improve the socio-economic status of the poor and the vulnerable.

The SLF and the TBL are supported by the principles of sustainable development which suggest that people, environment, technology, and economic viability be placed at the centre of development. The principle of sustainable development is very much applicable to this study because it espouses principles that are geared not only to the reduction of poverty but also for the protection of the natural resources (natural capital in the case of the SLF and planet in the case of the TBL approach).

Thus, in this study, the SLF and the TBL complement each other because, whereas the SLF helps to understand issues at both the household and the policy and institutional level, the TBL approach and the principle of sustainable development suggest the promotion of policies and institutions to protect the environment on which people depend on and to make sure that the people are not negatively impacted by development initiatives. Thus, the SLF and the TBL of sustainability help to respond to research question one: **How does access to water for domestic and productive uses affect households and their well-being?**

However, the responsibility to protect the natural and the built environment does not depend on policy makers and organizations and institutional arrangements only, but also on households and individuals. A closer look at the SLF, the TBL approach and the principles of sustainable development, showed that there was the need for an additional theoretical component to offer guidance on the issues to consider in exploring and analysing the role people's actions and behaviour play in protecting water and other environmental resources for today and tomorrow.

This gap is filled by the theory of planned behaviour, which has been extensively elaborated above (section 2.5). The theory of planned behaviour helps to understand people's perceptions, attitudes and behaviour. A better understanding of the factors influencing people's perceptions, attitudes, and behaviour may result in the implementation of measures which will achieve intended results of protecting and maximizing the benefits of water and environmental resources.

The theory of social representation draws attention to the socially constructed nature of perceptions, attitudes and behaviour. Thus, in a particular community, people's perceptions, attitudes, and behaviour will reflect what is common to that group. The theory of social representation indicates that a group of people usually share concepts which help them to make meaning of their environment. The theory of planned behaviour and social representation, helps in the response to research question two: **'Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced?'**.

The above four perspectives are also related to the principles of integrated water resources management because it also promotes some level of people involvement and seeks to generate appropriate organisational, policy and institutional environment for water and environmental management (section 2.6). Integrated Water Resources Management (IWRM) suggests that the concerns of the vulnerable, especially, are factored into interventions. Complementing sustainable development principles with the principles of IWRM was to ensure that people and organisations are not only encouraged to work together, but lead also to the protection of water and its related resources. Thus, the principles of IWRM, together with the SLF and the triple bottom line of sustainability helped to respond to research question three: **'How can organizations promote community participation in urban water and environmental management?'**.

The above theoretical perspectives are therefore important for the study because they assist in the analysis and understanding of people's livelihoods, their perceptions, attitudes, and behaviour which is necessary in order to protect water and environmental resources. The combination of the different theoretical perspectives (the SLF, the TBL of sustainability, the theory of planned behaviour, the theory of social representation, and the principles of IWRM) helped to place people, institutions, organisations, water,

and environment at the centre of the study. The above theoretical perspectives were relevant because they helped to:

- guide a people centred study focusing on individuals, households, and groups (communities)
- investigate the factors which influence people's access and use of water and environmental resources
- locate the policy and institutional environment as important in studies which seek to investigate the factors which influence the livelihoods of people
- suggest measures which could help to institute sustainable poverty reduction strategies
- investigate perceptions, attitudes, behaviour in a social and economic context of people's environment
- throw light on what to expect from individuals in order to protect water and environmental resources
- generate knowledge to encourage city managers to institute an integrated approach to address water and environmental problems

It is also important to note that whereas the SLF helped to explain the socio-economic component of the study, the theory of planned behaviour and social representation helped to explore the social behavioural tendencies of people.

Thus, the conceptual framework helps to respond to the overall goal of the study:

to understand the contribution water makes to livelihoods of urban and peri-urban households; the factors influencing perceptions, attitudes and behaviour in relation to surface water and the environment, and to identify measures for promoting community participation in water and environmental management.

In order to achieve the above expectations, there was the need for specific questions (section 2.8; this is a summary of the questions presented in chapter 1, section 1.3) to guide a systematic study of people's livelihoods, perceptions, attitudes, behaviour and the related policy and institutional context of the relevant stakeholders in the city.

2.8. KEY RESEARCH QUESTIONS

The research questions, strategically re-stated in this section, were to address three closely related issues on urban water and environmental management as well as the inter-linkages among these issues. The idea behind this restatement was also to remind

the reader of the questions before discussing the methods that are used to address them. The questions focused on how domestic and productive use of water affects households, and organizational and community participation in surface water and environmental management. The ultimate goal was to deepen knowledge in urban water and environmental management for responding to the current problems faced in the sectors. It is important to state that these questions built on the body of knowledge presented in chapters one and two with the intention of encouraging actual integration of other perspectives to protect water and environmental resources and reduce poverty.

2.8.1. Research Question 1:

How does access to water for domestic and productive uses affect households and their well-being?

- i. What factors influence access to water by households?
- ii. How is water use affecting households, including income from water dependent occupations?
- iii. What is the assets status of households?
- iv. What are the existing social relationships or networks and how do they influence households and occupations?
- v. What are the community perceptions of wealth and poverty? Do they encompass access to water?

2.8.2. Research Question 2:

Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced?

- i. What are the community criteria for and perception of surface [river] water quality and to what extent do these influence its use for various activities?
- ii. What is the state of sanitation and solid waste disposal and management practices, and how do they influence people's perception, attitudes, and behaviour to water and environmental quality?
- iii. Does household assets' status, including income, influence attitudes to surface water and environmental quality?

- iv. In the light of i, ii and iii, how can perceptions, attitudes and behaviour to surface water and environment be influenced by community and city initiatives?

2.8.3. Research Question 3:

How can organizations promote community participation in urban water and environmental management?

- i. What are the strengths, weaknesses, opportunities and threats of the selected key organisations in urban water and environmental management?
- ii. How can organisations promote community efforts towards urban water and environmental management in support of livelihoods?
- iii. In the light of the results from the study, what are the prospects for integrated urban water and environmental management?

2.9 SUMMARY

In summary, this chapter has presented the livelihoods framework to set the context for the investigation. It was indicated that it supports a people centred approach that helps to conduct a participatory assessment of people's assets [human, financial, social, natural, and physical] and to understand what strategies might be appropriate to overcome poverty. Understanding of these strategies may be refined by the analysis of the sources and nature of vulnerability. One of the goals of the Sustainable Livelihoods Framework is to support studies and interventions that will help reduce poverty and bring improvement into people's lives.

Since the research took place in an urban environment, the urban context was appropriately set for the investigation touching on urban related issues, sustainable development and relating them to the Triple Bottom Line approach which adopts a three pronged concept of people, planet, and profit. This was also related to the Sustainable Livelihoods Framework.

Aspects of urban structure were discussed and related to people in urban places. Urban environmental management was discussed and related to urbanization in the city. The context of the urban water environment was also set, linking specifically to the focus catchment, the Odaw-Korle River. Gaps in previous investigations carried out on water were identified relating to the human-environment interaction. A body of literature on

perceptions, attitudes and behaviour was explored as part of the theoretical background for responding to the gaps in the human-environment interactions; in particular, the theories of planned behaviour and social representation.

The concluding part of the review focused on the position of the integrated approach in urban water and environmental management, where some of the existing viewpoints in this particular perspective were explored. It concluded with a summary of the key theoretical background and the research questions, to lead to the methodology employed in the study.

CHAPTER THREE : METHODOLOGY AND DESCRIPTION OF THE STUDY AREA

The theoretical background was established in chapters one and two and the research questions defined. This chapter describes the methods used to investigate the various research questions presented in chapter one and gives background information on the communities where the study was conducted. An explanation of the criteria and process for identification and selection of the communities for the study is provided (3.1.1).

A brief theoretical background to Focus Group Discussion (FGD) as a method of qualitative research is provided with an elaboration of the purpose of the FGD and the process applied to invite community members to participate. The process of conducting and documenting the results of the FGDs is also described (3.1.2). The chapter continues with a justification and discussion of the limitations of the approach as a qualitative data collection procedure.

In section 3.1.3, the procedures used in selecting organizations for interview are elaborated. A brief overview of quantitative research methods and the process of selecting the household samples for interview in the communities is also explained (3.1.4 to 3.1.5). This is followed by a discussion of water sampling and laboratory analysis (3.1.6). Data management and analysis is presented in section 3.2 emphasising qualitative data analysis (section 3.2.1) and quantitative data analysis (3.2.2). Additional information on Accra is presented (3.3). A brief description of each community; governance, land use patterns, nature of buildings, among others is presented and illustrated with some photographs (3.4).

The main data collection for research questions one (see section 2.8.1) and two (see section 2.8.2) was conducted through the focus group discussions, whereas the second part of the data collection was achieved through the household interviews, using questionnaires. Surface water quality analysis generated information to add to answering research question 2(i). Organizational interviews generated information to answer some aspects of research question three (that is 3.i and 3.ii; see section 2.8.3), while 3(iii) was answered with information generated for all the three research questions. The study employed mixed methods in which both qualitative (section 3.1.2) and quantitative (section 3.1.4) data was collected and used to answer the research questions.

3.1 METHODOLOGY

This section discusses site selection and its justification, choice of qualitative research methods, organisational analysis, quantitative research methods, household interviews, water sampling and laboratory analysis.

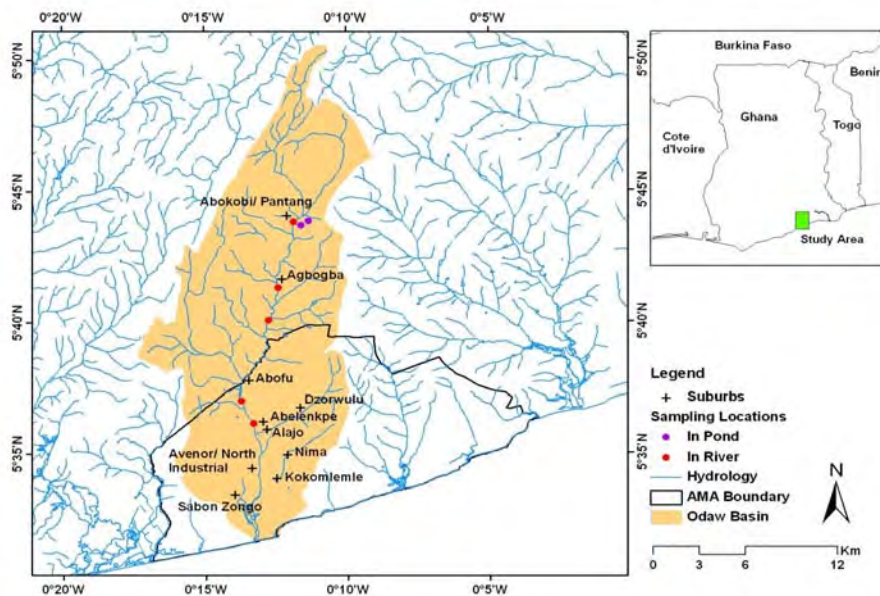
3.1.1 Justification for selection of study sites

This section outlines the criteria used to select the study communities in which focus group discussions and household interviews took place and water samples were collected. There are different classifications within the city and these were explored to help develop a sampling framework. In this vein, classifications based on electoral boundaries, income and expenditure, and property rates were considered.

3.1.1.1 Site selection criteria

Since the study was in the Odaw-Korle River catchment, I began by using a catchment map (CERSGIS, 2003) (Figure 3.1) to provide the initial spatial information on the catchment.

Figure 3.1: Map of selected communities (suburbs) and water sampling locations in the Odaw-Korle River Catchment



(Source: adapted from CERSGIS, 2003)

In addition to the information provided in section 3.1.1, I decided on the criteria (Table 3.1) below, in order to select the communities where interviews were to be held and also

for surface water samples to be collected. Table 3.1 indicates the criteria which aided in the final selection of communities. I decided on these criteria in response to the research questions.

Research question 1: *How does access to water for domestic and productive uses affect households and their well-being?*

In order to explore the above question, I needed to investigate different dimensions of socio-economic situations or conditions. This was expected to present different shades of circumstances in relation to occupations, incomes, livelihoods, construct of wealth and poverty. Different income levels were considered as indicator of wealth within communities. Access to water was used to differentiate impacts on households. The socio-economic conditions were also expected to show different household circumstances which could offer the opportunity for comparison to achieve the objectives of the study.

Research question 2: *Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced?*

To investigate different perceptions, attitudes and behaviour, different levels of infrastructure provision were needed as this was expected to present different conditions of access to sanitation and solid waste management; different experiences in terms of accessing this infrastructure. Different responses to the problems of access were also envisaged to aid in comparative analysis. The perception studies were expected to identify differences in views and beliefs. The selected communities were also expected to be locations where water samples could be collected for laboratory analysis. In line with the biophysical criteria, it was important to include communities which were more likely to influence the river directly or indirectly in the study to present recommendations on water and environmental management.

Table 3.1: General criteria for community selection

Criteria	Description
<i>Community category</i>	Differences and similarities in communities may cluster a population. Various dimensions of poverty and what it means to be “trapped” in or “escape” from poverty should also be understood.
<i>Access to potable water</i>	It should allow for a study of the various dimensions of use within the catchment
<i>Sanitation and waste management practices</i>	It should allow for the different dimensions of access to various types of sanitation, solid and liquid waste management services to be investigated.
<i>Biophysical</i>	The community should enable selected water assessment on the river to be carried out. Water quality problems of the Odaw River are mainly within the AMA boundary (Available literature).
<i>Perception studies</i>	It should be possible to investigate various perceptions, attitudes and behaviour, among others on surface water and environmental quality and use systems

3.1.1.2 Classifications within the city

The different classifications within the city are discussed below.

The Electoral Commission of Ghana is mandated by law to carry out demarcations within the country (for both urban and rural areas). Below are the criteria used by the electoral commission in demarcating the various zones:

Metropolis	-	Beyond 100,000 individuals
Municipality	-	100,000 individuals
District Assemblies/ District Councils	-	75,000 individuals
Town Councils	-	5,000 individuals
Electoral area	-	1,000 (in some cases 1500), thus two or three units may make up one electoral area)
Unit	-	500 individuals

The factors considered by the Electoral Commission in arriving at these demarcations are :

- Economic viability

- Infrastructure provision
- Community of interest (that is whether two communities could be joined together into one district or not) (Personal Communication, 2008; this was in response to my request for clarification on classifications in urban centres)

The Ghana Statistical Service does not demarcate localities (or communities). They rather work with all communities identified by the District Assemblies, using their list to demarcate all the communities into enumeration areas. One enumeration area consists of about 700 individuals. Thus, population size is the main factor for the zoning of enumeration areas for census and survey purposes.

There exists also an income and expenditure classification of the Accra Metropolitan Assembly and gazetted in the Local Government Bulletin, 2002 (Tables 3.2 and 3.3) which groups communities into four main classes (that is first, second, third, and fourth) (Local Government Bulletin, 2002).

Table 3.2: Average annual per capita income in Accra

Class of community	Average annual per capita income (\$)
First	1,519.80
Second	883
Third	793
Fourth	408

Source: AMA website: http://www.ghanadistricts.com/districts/?r=1&_3&sa=3004

Comparing with the Gross Domestic Product of Ghana, people of Accra were well off. Annual average per capita GDP of \$915.09 was far higher than Ghana's GDP of \$350 per capita in the year 2002.

The fourth classification is the 2008 list of property rates which the AMA required house and other property owners in communities to pay. This classification groups communities into 1A, 1B, 2A, 2B, 3A, 3B and 3C residential areas, with 1A paying the

highest and 3C the lowest. The assessment of property rates takes into account the infrastructure provision and the environmental conditions in the community.

There were no maps to indicate the boundaries of the electoral areas and therefore it was difficult for this to be considered in deciding the sampling frame. Secondly, the electoral areas do not follow the boundaries of the communities. It was not difficult to identify the boundaries of the communities since major roads and natural features are used to delineate them. Income and property rates were useful in providing basic information because they were used to differentiate the individual communities (Table 3.3). The income classification also aided in assigning likely property rates for communities which were not found among the payment of property rates list. Thus, property rates were used as a proxy for infrastructure provision.

Table 3.3: Classification of selected communities in Accra based on average annual per capita income and property rates

	Selected communities (localities) ¹	Population (Year 2000)	Communities classified by AMA by income (2)	Classification according to AMA 2008 imposition of property rates (Ghana cedi) ³						
				1A	1B	2A	2B	3A	3B	3C
1	Abokobi/Pantang	-								
2	Agbogba	-								
3	Abelemkpe	7,563	1		x					
4	Dzorwulu	9,517	1		x					
5	Kokomlemlé	27,616	2			[x]				
6	Nima	69,044	3						x	
7	Alajo	23,439	3				x		x	
8	Abofu	33,352	3						[x]	
9	North industrial area (Avenor area)	8,053	3						[x]	
10	Sabon Zongo	18,616	4						x	

X: property rate classification; x was assigned by the city classification; [x] was assigned by the researcher based on the existing information

¹ [Abokobi-Pantang and Agbogba are outside the official city boundary, that is they are in peri-urban Accra]

²Source : http://www.ghanadistricts.com/districts/?r=1&_=3&sa=3004; gazetted in the Local Government Bulletin, 2002

³ Key (Figures quoted in Ghana cedi are minimum values) per house or property: 1A=50; 1B=30; 2A=25; 2B=20; 3A=15; 3B=10; 3C=8. A dollar is equivalent to GH¢ 1.44 as at August 19, 2010. The property rates were based on infrastructure provision and environmental conditions (Local Government Bulletin, 2008).

Table 3.3 shows that there were two rates for Alajo. Houses situated at places considered to have higher infrastructure provision and better environmental conditions than the rest of the houses in Alajo were required to pay more. Three of the communities were omitted from the city property rates list and therefore, I used the information on the income classification to assign likely property rates for them. These are Kokomlemle, Abofu, and North Industrial Area (Avenor).

City classifications did not consider location in reference to the river nor differences between perception, attitudes and behaviour. For the purposes of the city classification (which usually helps the city managers to collect property rates and allocate certain resources), proximity to the river course or otherwise and perceptions attitudes and behaviour were not considered to have any direct relevance to the classification.

In relation to community category, Table 3.3 shows that there are differences in the communities in terms of the income levels of households. Secondly there are differences in terms of the infrastructure provision and environmental quality. These demonstrate that the relevant background criteria for selection of communities for the investigation are satisfied.

3.1.1.3 Initial investigation and selection of communities

The next stage of actions to decide on the sampling frame involved visiting as many communities as possible to ascertain whether the classification as provided by the city was reasonable for such a study. Secondly, the visit was also to ascertain whether actual conditions on the ground reflected the city classification. This was important because some of the information on the city classification could be said to be outdated (carried out in 2002). A list of the communities in the city was compiled (Appendix 3.1). The communities visited included Abokobi-Pantang, Agbogba, Haatso, Abofu, Abelemkpe, Dzorwulu, Kokomlemle, Alajo, Nima, Kpehe, Korle Gono, Abogbloshie, Abofu, North

Industrial Area (Avenor), Achimota, Maamobi, and Sabon Zongo. Appendix 3.1 shows the communities listed by AMA, the ones within the city (approximately 173 based on AMA classifications), the ones within the catchment (approximately 47 based on my knowledge of the city and aided by the catchment map), the ones adjacent to the river or have indirect influence within 0.5-1km (approximately 17 based on my knowledge of the city and aided by the catchment map), and the ten selected communities and those not selected.

On the basis of the information in 3.1.1.3 above, the proximity (adjacent) to the Odaw-Korle River catchment (as indicated in Appendix 3.1 and in the criteria in Table 3.1), the ten communities indicated in Table 3.3 (and also Appendix 3.1) were selected to represent different infrastructure provision and environmental conditions. Further details on the reasons for selecting the ten communities are presented below.

Abokobi-Pantang: this community was selected to represent a peri-urban condition and also a place where the surface water was used by community members for various domestic activities. In terms of the stretch of the river, it is closer to the head of the river (Figure 3.1). It is a community where the ground conditions showed that there is limited human impact on the river.

Agbogba: in terms of the direction of flow of the river towards the sea, the community of Agbogba comes after Abokobi-Pantang (Figure 3.1). It was selected to represent a second community with peri-urban conditions. Here too, the water is used for some activities by people and there was evidence of increasing human influence on the river and the environment. Therefore both Abokobi-Pantang and Agbogba were important for comparison with communities within the AMA boundary.

Abelemkpe: was selected to represent conditions of high environmental quality and high infrastructure provision (such as sanitation, water supply, and housing conditions). Its location along the river course meant that there could be some influence on the river by the community members.

Dzorwulu: was selected to reflect conditions of high environmental quality and high infrastructure provision. Its location along a tributary of the river meant that its possible influence on the river could be investigated. It is also a community which hosts urban

farmers engaged in vegetable production. It reflects a situation where the water is used solely by non community members in crop cultivation, while wastewater and runoff from the community is channelled into the river.

Kokomlemle: was selected to reflect high environmental quality and high infrastructure provision. Its location, about 0.5km from the river, meant an indirect influence on the river through channels which transport wastewater and runoff from the community to the river.

Nima: was selected to reflect medium infrastructure provision and environmental quality. Its location along a tributary of the river meant a direct influence on the river.

Alajo: was selected to reflect medium infrastructure provision and environmental quality. Its location along the river course and a tributary of the river at the same time meant that there could be possible influence.

Abofu: was selected to reflect low infrastructure provision and low environmental quality. Its location along the course of the river meant that there could be possible influence on the river. It is also near a place which used to be an AMA approved human waste discharge point.

North Industrial Area (the focus community is Avenor): It was selected to reflect a community with low infrastructure provision and low environmental quality. Its location along the course of the river meant that there is possible influence from the community on the river.

Sabon Zongo: It was selected to reflect a community with low infrastructure provision and low environmental quality. Its location near the Korle Lagoon area meant that waste from the community will eventually end up in the river and the lagoon system.

The differences (such as environmental quality, infrastructure provision: water and sanitation, roads, economic activities, housing conditions etc) observed in the field meant that the analysis would be more beneficial if some grouping was done to reflect aspects of what was observed and the city classification. On the basis of this, Abokobi-

Pantang and Agbogba were placed in the peri-urban category (Table 3.4) since they are located outside the official AMA boundary as mentioned above.

Comparing observations in the field at Kokomlemle with Abelemkpe and Dzorwulu showed that the three communities could be considered similar from the perspective of high infrastructure provision and high environmental quality. Since they all had high environmental quality, high infrastructure provision (such as high access to water, sanitation, and housing conditions) as indicated above.

In the same vein, comparing the infrastructure provision in the field, (such as the housing conditions, environmental conditions, commercial infrastructure), Nima and Alajo were closer and slightly ahead of Abofu, North Industrial Area (Avenor), and Sabon Zongo.

The combination of the information in Table 3.1 and 3.3, visits to the community, the research questions, and literature, led to the grouping of the selected communities into the four categories (Table 3.4), which are Peri-urban, High infrastructure provision, Medium infrastructure provision, and Low infrastructure provision communities for the purposes of this study.

Table 3.4: Selected study communities

Group	Communities
<i>Peri-urban</i>	<ul style="list-style-type: none"> • Abokobi-Pantang • Agbogba
<i>High infrastructure provision</i>	<ul style="list-style-type: none"> • Abelemkpe • Dzorwulu • Kokomlemle
<i>Medium infrastructure provision</i>	<ul style="list-style-type: none"> • Nima • Alajo
<i>Low infrastructure provision</i>	<ul style="list-style-type: none"> • Abofu • North Industrial Area • Sabon Zongo

It is important to compare the grouping on Table 3.4 with the city classification based on income. The city classification places Dzorwulu and Abelemkpe together,

Kokomlele separately, Nima, Alajo, Abofu, and North Industrial Area (Avenor) together, and Sabon Zongo, the lowest, separately. In the city classification based on income, the high and low categories correspond to the classification based on the payment of property rates as indicated on Table 3.3, in which the high infrastructure provision communities pay higher rates than the low. The category medium infrastructure provision, where infrastructure provision and environmental quality is considered between the high and low infrastructure provision communities, was created by the researcher for the purposes of this study as indicated above.

3.1.2 Choice of Qualitative Research Methods

The section explores briefly some of the qualitative research methods and makes a case for the choice of focus group discussions employed in the study. The focus group discussions were particularly suited for the study as they considered perceptions, attitudes and behavioural issues of people in relation to water and the environment. This also meant selecting the people and then engaging them in a discussion. Thus, selection of focus group participants, focus group discussion protocol, and justification and limitations of the focus group technique or tool are discussed.

Some examples of the areas which qualitative research helps to investigate are: persons' lives, experiences, perceptions, attitudes, behaviours, emotions, feelings, or organizational functions, social movements, and cultural phenomenon. Qualitative research produces results which have not been achieved through statistical procedures or other methods of quantitative analysis (McGiverns, 2006).

Qualitative methods can be used to explain or understand thought processes and emotions which are difficult to achieve through more conventional research methods (Straus and Corbin, 1998; Wimpenny and Gass, 2000). Some examples of qualitative data are interview results, observations, documents, films, and video recordings. Some of the data may be quantified, but most is interpretive. In qualitative data analysis there is a non mathematical process of interpretation to identify relationships in raw data to explain a phenomenon or what is happening in data in a particular context.

Thus, the decision to apply qualitative methods in understanding livelihoods, perceptions, attitudes and behaviour, as well as organisational and institutional processes, was appropriate for the subject. This was expected to enable insights,

explanations and understanding to be derived from the data. There are several tools used for qualitative research that are well documented in the literature; focus group, individual interviews, observations, participant observation, and anthropological tools, among others (Miles and Huberman, 1994). Further details on the selected tools (for qualitative methods) used is presented below.

3.1.2.1 Focus Group Discussions (FGDs)

The FGDs allowed initial qualitative information on perceptions, attitudes, and behaviour patterns on water for livelihoods, water and environmental quality to be obtained. The subsequent sections present the processes employed to arrive at the intended data collection.

Prior to the start of the FGD, several visits were paid to Abokobi-Pantang, Agbogba, Abelemkpe, Dzorwulu, Kokomlemle, Nima, Alajo, Abofu, North Industrial Area (Avenor), and Sabon Zongo with some general questions and to make general observations which helped to refine the questions used as a guide in the FGDs. This initial visit offered the opportunity to interact with the communities and their leadership to find out if they will accept the study in their community. A generic set of questions, guided by the research questions were developed for the FGDs. A sample of the semi-structured checklist used for the FGDs is placed in Appendix 3.2.

In order to formulate the questions for the preparation of the checklists, there was an initial review of literature relating to the study topic, and the development of the research objectives and the research questions to be answered. Since the livelihoods framework was being applied as a tool to explore people's livelihoods in order to answer the research questions, areas for discussion in the focus groups were identified to reflect some elements of the framework (such as water use for livelihoods: access and use of water; social networks; and wealth and poverty). Since the FGDs were also exploring perceptions, attitudes, and behaviour, thematic areas for discussion were identified to reflect this (such as: perceptions of water quality, sanitation and waste management; and changing behaviour leading to water and environmental pollution. Questions were also formulated around the theme of institutional commitment to find out how communities perceived various water and environment organisations and their functions in controlling pollution. When the checklists were ready, steps were taken to invite people to participate in the focus group discussions.

3.1.2.2 Selection of FGD participants, follow-up, and logistic arrangements

In each of the ten selected communities, I approached individuals from different parts of the communities to participate in the FGDs. I briefed each individual on the purpose of the discussion, which was to encourage them to freely share their views on various topics that the discussion was going to cover. I informed them that through this, they were helping to respond to existing problems in the water and the environment sectors. Furthermore, they were informed that the findings from the discussions were going to contribute to knowledge on the challenges which the communities faced and how policy makers could use the results for possible interventions. Individuals who were willing were included in the list of prospective FGD participants and their particulars noted.

Several visits and telephone calls were made to participants in the communities before the FGDs were held. On many occasions people who had early on agreed to be part of the discussion were either out of contact, or could not be found and therefore new people had to be invited to replace them (in some cases, the discussions had to be rescheduled). In general, five to eight individuals turned up for each discussion, except on a few occasions where the participants exceeded eight people. Key persons among the potential participants were identified who assisted with securing meeting places for the FGDs as well as other logistics such as chairs and arrangements for refreshments with the cost borne by the study.

Four separate FGDs were held in each of the ten selected communities, except Agbogba where only two were organised. The four groups were a mixed group, a men's group, a women's group, and a young adults group (comprising male and female). In the case of the mixed group, I ensured that at least two representatives of elderly men, elderly women, young male adults, and young female adults were invited from different parts of the community. In the case of the young adults, equal numbers of both young men and women were invited from different parts of the community to be part of the FGDs. This ensured that bias was reduced. The men and women's FGDs were for individuals aged 36 and over, whereas the young adults group were aged between 18 and 35. In all, 38 FGDs were organized in the ten selected communities.

The four different groups were to help to receive different shades of views from participants. The men's and women's groups were to encourage deliberations of problems and concerns which might be difficult to discuss if the opposite sex happened

to be in the group. In the same vein, the young adults' group was to encourage the youth to freely discuss problems and concerns which otherwise would have been difficult to discuss in the mixed or adult group. Therefore it was expected that ultimately it would improve the diversity of the findings from the FGDs.

3.1.2.3 FGD protocol

The Focus Group Discussions always started with an introduction by the researcher (me), the field assistant and then participants. There was orderliness as participants in general waited patiently for others to end their contribution before presenting their views. In a few instances, disagreements had to be noted between some participants. Participants were encouraged to ask questions or discuss issues relating to the topic.

I facilitated and also took notes of the discussions. This posed no problem at all as I was conversant with the questions and the language used by participants and also ensured smooth guidance to bring out key issues. Whenever necessary, the field assistant helped with interpretation of some local languages (particularly in 'Ga').

At the end of each discussion, participants were encouraged to raise concerns they thought relevant to the discussion, but which had not been discussed. The discussion always ended with an expression of appreciation to the participants and telling them of the proposed follow-up with further investigations in the form of household interviews. After each discussion, I reflected and noted down some general impressions in the form of memos. Overall, 210 people from the ten selected communities were involved in the FGDs.

3.1.2.4 Justification of the FGD method

The investigation was about livelihoods, perceptions, attitudes, and behaviour of people, and organisations. The appropriate approach was therefore needed to obtain as much data for analysis and upon which further investigation was also to be based. The investigation was supposed to be people centred such that the results would be grounded in the actual situation in the field. The FGDs elicited people's knowledge and opinions in each of the communities. This data was important for the analysis of the factors influencing access to water for livelihoods, behaviour and organisations from the perspective of the people. The FGDs findings were input into the design of the structured questionnaire study

The FGDs elicited data in each of the communities regarding the state of affairs, such that the knowledge and opinions of people were expressed and recorded and could be analysed in order that the factors influencing access to water for livelihoods, behaviour and organisations was obtained for analysis. A suitable method of analysis of the FGDs was also important in order to distill the relevant concepts and themes for discussion. This is where the grounded theory approach to qualitative data analysis was most useful (see section 3.2.1). In line with the research objectives, views, perceptions, feelings, thoughts, ideas, etc were explored. The grounded theory provides guidelines as to how statements of focus group participants could be synthesised into meaningful results.

3.1.2.5 Limitations of the FGDs method

The process was time consuming because prospective participants had to be contacted many times before FGDs. Some of the discussions had to be postponed (as mentioned above) because some prospective participants failed to turn up. Though it was difficult inviting people for the discussion, it still had to be rescheduled whenever necessary. Sometimes participants came in late and delayed the discussions.

Since people had to rely on recall and experiences it is possible some might have forgotten some ideas and could not share. Others may also have exaggerated to create self importance. It is possible that in the mixed groups people who were shy may have been unable to express their views adequately, or at all. The discomfort of expressing sincere opinions due to the presence of other community members may also have prevented some people from sharing their views. With this in mind, responses were triangulated by carefully bringing up some issues or concerns raised by one group in another group in each community. Overall, some of the issues were formulated into attitude statements (or opinions) in the questionnaires which were tested in the household survey.

Since the study was expected to relate people's opinions to what key organisations were also doing, it was necessary for a method that would help in understanding the mandates and the capacity of the key organisations, and how these could be influenced to respond to the issues emerging from the study.

3.1.3 Organizational Analysis

Organisations with core mandates that involved some aspect of water, sanitation, and waste management were considered important for the study. Based on their mandates, I grouped the organisations as regulatory; ministries, departments, and agencies; research; service providers; and non-governmental. Ten (in actual fact 11 but no interviews could be secured with the 11th organisation) priority organisations were selected for interviews from these groupings based on importance and influence [Table 3.5; developed for the study by the researcher]. In Table 3.5, the Ministry of Local Government and Rural Development was not selected because actual implementation of the waste and sanitation policies was at the level of MMDAs (Metropolitan Municipal and District Assemblies). It was also ranked of medium importance by the the researcher. The Hydrological Services Department was not selected because of its low influence and therefore its low relevance in relation to the research objectives. The AMA planning and coordinating Unit, though of high influence, was not included because actual implementation occurred in the three other Departments in AMA included in the investigation. The organisational analysis was responding to the research question three:

How can organizations promote community participation in urban water and environmental management?

Therefore, I needed to understand how important they are in terms of their mandates and their influence in terms of power and resources in water and environmental management.

The degree of importance was defined by the researcher as:

- *low*; mandate incorporates some aspects of water and environmental issues
- *medium*; mandate incorporates some aspect of water and environmental issues and there is indirect relationship with water and environmental management
- *high*; mandate incorporates most aspects of water and environmental issues and bears responsibility for drainage, local governance, and clean and healthy environment

The degree of influence was defined as:

- *low*; low power [to affect people and events in relation to water and environmental management
- *medium*; some power to affect people and events based on statutory, financial, and human resources in relation to water and environmental management
- *high*: high power to affect people and events based on statutory, financial, and human resources in relation to water and environmental management; involved directly or indirectly in policy formulation; regulatory role; advocacy role; coordinating other bodies; issuing permits; treating and distributing water.

Meetings were arranged with key informants within ten of these organizations. The discussions with the key organizations centred on certain internal structures which ensure smooth running of the organizations (that is various levels of capacity). The issues discussed included organisational strategic planning and programme implementation; quality assurance; external relationships; human resource management; financial management; communication and information management; feedback from the public; and complaints procedure and staff code of conduct (see Appendix 3.3 for the checklist of questions which were used).

Table 3.5: Importance and Influence of selected organizations

Organization	Importance	Influence	Selected (S) / Not selected(N)
1. Environmental Protection Agency	High	High	S
2. Water Resources Commission	High	High	S
3. Public Utilities Regulatory Commission	High	High	S
4. Ministry of Water Resources Works and Housing [Water Directorate]	High	High	S
5. Ministry of Local Government and Rural Development	Medium	High	N
6. Hydrological Services Department	High	Low	N
7. Town and Country Planning Department	High	Medium	S
8. AMA Waste Management Department	High	Medium	S
9. Metropolitan Public Health Department	High	High	S
10. AMA Planning and Coordinating Unit	Medium	High	N
11. Water Research Institute	High	Medium	S
12. Ghana Water Company Limited	High	High	S
13. WaterAid	High	medium	S

14. CONIWAS	High	medium	S
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Note: Though WaterAid was selected, it was not possible to arrange a meeting with them; See Appendix 3.4 for other stakeholders in the water and environment sectors.

Limitations of key informant interviews

The key informant interviews, as a tool, were useful in engaging with the organisations. Various issues, as shown on the checklist were discussed. However, sensitive issues such as financial misappropriation could not be explored. Organisations were cautious about sharing such sensitive information.

3.1.4 Quantitative research methods

The objectives of the study and the research questions to be answered guided the selection of the quantitative method used in the study. In general quantitative methods are useful when data in the form of values are required for particular characteristics. It is useful when data relating to how much, how many, what size, what weight, what volume etc are needed. When ranked data is needed, it can also be very useful.

In relation to this study, data on socio-economic characteristics of respondents such as age, household size, household income, quantities of and cost of water used, as well as other household characteristics etc. were needed for analysis, in line with the objectives of the study. Some constructs relating to poverty and attitudes had been developed from focus group analysis and these had to be ranked by individual respondents. This is because individual opinions were needed for analysis and also to compare with some of the findings from the focus group analysis. Therefore the choice of quantitative method, which was the structured questionnaire interview, was appropriate because it enabled the investigation to realise the needed data in line with the objectives.

Quantitative data can be collected through structured or semi-structured questionnaires. The questionnaires can be 'self-completed' by the respondent or 'interviewer administered'. The nature of the investigation, the objectives of the study, and the literacy of respondents determined how the questionnaires were to be completed (McGivern, 2006; Spratt *et al.*, 2004).

3.1.4.1 Household Interview

This phase of the study followed the FGDs where questionnaires (Appendix 3.5) were designed with key issues emerging from the FGDs. Specifically, the household interviews with the questionnaire made it possible to test some of the households' opinions and attitudes and also measure contributions of water dependent occupations to households. Questions such as the contributions of water dependent occupations, require testing to make them valid. This was important because one of the benefits of the mixed methods employed in the study was to allow the methods to complement one another (see end of section 3.2.3 for a discussion on the advantages of the mixed method in this study). Therefore by testing the opinions and attitudes, it helped to understand how they are reflected in the wider population. Table 3.6 below shows the sampling distribution for the various communities and the justification. In all, 443 households were sampled.

The sampling procedure selected was the multistage stratified cluster sampling employing disproportionate allocation of samples to each community [cluster]. The disproportionate allocation of sampling was selected because the difference between the number of households in the largest and smallest communities meant that in proportionate allocation, about half would have had to be sampled from only one community, Nima, and the remaining sampled from the nine other communities.

Table 3.6: Sampling Allocation for household interviews in the Odaw-Korle River Catchment [N=443]

Community	No. of Households in community	Equal allocation of samples	Proportionate allocation	Disproportionate allocation
Abokobi/Pantang	505	40	6	40
Agbogba	1517	40	17	42
Abelemkpe	1467	40	16	39
Dzorwulu	1940	40	21	40
Kokomlemle	5839	40	64	43
Nima	15050	40	167	70
Alajo	4835	40	53	42
Abofu	2968	40	33	44
North Industrial	1579	40	17	40
Sabon Zongo	4156	40	46	43

Total	39,856	400	440	443
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Three enumerators who were familiar with the local language assisted in the household interviews. A two day training was organised for the enumerators to ensure that all had a common understanding of how to approach the interviews which were conducted in the local languages (commonly: Akan languages; Twi and Fante; and Ga) and in some cases English for people who were literate and opted to be interviewed in English.

The administration of the questionnaire took the following form. In each community, firstly the boundaries were noted with the aid of local residents. The lanes running through the communities or sections were also noted. Each of the four enumerators was then assigned a specific lane(s) or section of the community by the researcher to administer the questionnaires to households and asked to ensure that there was a spread (equal spacing between houses where households were living) of the selected households in order to get a representative sample of the community. This was carried out systematically from one section to the other.

Limitations of the questionnaire as a tool

Volumes of water used were estimated from number of buckets used or the amount of money spent on water per day or month. Assets owned were also reported by households as it was not possible to do an individual inventory of households. The defensive tendency of individuals to respond in a way that is consistent with societal norms or beliefs is ‘social desirability’. In comparison, ‘social approval’ is the tendency for an individual to look for a positive response in testing situations and therefore is very little focused on defensiveness. Biases resulting from social desirability and approval frequently are observed in situations that can be seen as a test and some responses may be more socially acceptable than others (Herbert et al., 1997). To overcome this, individuals were asked to present their views on attitude statements on a wide range of issues and not necessary issues that demanded personal responses on what respondents were doing or not doing.

3.1.5 Participants at Focus Group Discussions and household interviews

Table 3.7 shows the background characteristics of participants in the FGDs and household survey in the selected communities.

Table 3.7: Background characteristics of respondents

Community	Participants in FGDs					Respondents of household survey		
	Mixed group	Men	Women	Young adults	Total	Men	Women	Total
Abokobi-Pantang	6	8	9	7	30	17(42.5%)	23(57.5%)	40
Agbogba	-	7	6	-	13	17(40.5%)	25(57.5%)	42
Abelemkpe	5	5	6	6	21	14(35.9)	25(64.1)	39
Dzorwulu	9	5	5	6	25	15(37.5%)	25(62.5)	40
Kokomlemle	5	4	5	4	18	15(37.5%)	28(62.5%)	43
Nima	12	6	6	6	28	26(37.1)	44(62.9%)	70
Alajo	6	7	5	5	23	19(45.2)	23(54.8%)	42
Abofu	10	8	6	6	30	10(22.7)	34(77.3)	44
North Industrial Area [Avenor]	5	6	6	5	22	10(25%)	30(75%)	40
Sabon Zongo	5	8	5	7	25	14(32.6%)	29(67.4%)	43
Total =38 Focus group discussions					210			443

Thus, the selected approach to data collection involved; initial interactions with the selected community members, focus group discussions, individual household interviews, and key informant interviews. These were important for obtaining the qualitative and quantitative data. Since the study was carried out within the surface water catchment, it was important to establish the current state of the water at different locations as a reference point for comparing people's perceptions about water quality in the different communities. Additional information on respondents is placed in Appendix 3.6.

3.1.6. Water Sampling and Laboratory Analysis

Water samples were collected for laboratory analysis to ascertain its quality. This was important because the study was considering people's perceptions about surface water and environmental quality. Therefore findings from these investigations on the water quality could be compared with people's perceptions about the water. In terms of the wider contribution to the study, understanding the water quality meant that there was a clear basis for comparison of people's perceptions in different communities across different sites in the catchment.

The following parameters were measured for the respective reasons. Temperature was analysed to provide information on whether any discharges are affecting aquatic life. This is important because of its relationship with other parameters important for safe water quality. Acidity (pH) was measured to ascertain whether there was an occurrence of some form of chemical pollution which can influence the natural background concentration of the water. Conductivity was analyzed to investigate human waste and wastewater influence.

It was important to analyze for turbidity because it provides information on how human interaction with the land is releasing earth pollutants into the river. Dissolved oxygen and biochemical oxygen levels were important as indicators of organic pollution from either solid or human waste from the communities and their surroundings. Chemical oxygen demand measurements were to provide additional information on organic and inorganic pollution. Phosphate and nitrate levels were determined to provide information on the extent of organic and inorganic pollution to the river. Faecal coliforms were determined to help draw conclusions on the likelihood of human or animal waste pollution in the surroundings (see Appendix 5.1 for further explanatory notes on the parameters).

Water samples were collected from sampling locations in four of the ten selected communities (Figure 3.1), and an additional location on the stretch of the river over a period of six months. Water samples for physico-chemical analysis were placed in 1.5 litre plastic bottles and transferred in an ice box to the laboratory.

Water samples for dissolved oxygen (DO) and biological oxygen demand (BOD) were put into DO and BOD glass bottles. The bottles for the BOD samples were either dark or were covered with Aluminium foil to prevent intrusion of sunlight which could have initiated photosynthesis to release oxygen and thus affect the results. The BOD samples were carried in a dark box to the laboratory. The samples for the DO analysis were fixed in the field with Winkler I and II solutions to prevent consumption of the dissolved oxygen from biological activity.

Different water samples for the microbiological analyses were drawn directly from the river into sterilized glass bottles. The sterilised glass bottles for the microbiological analysis were lowered to a depth of about 20 cm [surface samples] with the hand behind

the base and allowed to fill and closed quickly to prevent re-contamination from atmospheric air. Samples for microbiological analysis were kept in an ice box and transported to the laboratory for analysis.

Temperature, conductivity, and pH of water were measured in the field using a conductivity meter. Turbidity was determined using the Turbidimeter of model HACH 2100P. The biological oxygen demand and dissolve oxygen were determined by chemical titration; chemical oxygen demand; total nitrogen and total phosphate were determined by Spectrophotometric procedures following standard procedures as described by the APHA, AWWA, WEF (2001).

As the different sets of data were collected, relevant spreadsheets were created to enable data management for subsequent analysis.

3.2 DATA MANAGEMENT AND ANALYSIS

The section describes the qualitative and quantitative data analysis techniques adopted, emphasising how concepts and themes were generated from qualitative data and linked together with statements of relationships to explain what is happening in the data. Analysis of strengths, weaknesses, opportunities, and threats was employed for the organisational interviews. A brief overview of quantitative data analysis is also provided, leading to choice of types of analysis to use, including the principal component analysis which helps to reduce data with a large number of variables into a smaller number of variables to aid in its interpretation.

3.2.1 Qualitative data analysis

Grounded Theory provides the theoretical underpinning for the qualitative approaches to studying perceptions, attitudes and behaviour toward water and environmental quality. This is because the approach is a way of doing qualitative and inductive research. The idea of referring to Grounded Theory is not to say that its complex detail of analysis was followed, but to indicate that rather than deducing concepts from known theories, concepts and themes were allowed to emerge from the data through systematic and rigorous analysis as demonstrated in Table 3.8 and then used to develop sets of explanations from the data.

To enhance the discussion on grounded theory, the presentation following was moved from the appendix. The development of grounded theory helped to avoid highly abstract sociology. The main impetus behind the movement was to bridge the gap between theoretically “uniformed” empirical research and empirically “un-uniformed” theory, by grounding theory in data. As a formal theory, first presented by Glasser and Strauss in their 1967 book *The Discovery of Grounded Theory*, it was premised on a strong intellectual justification for using qualitative research to develop theoretical analysis. Given its emphasis on new discoveries, the method is usually used to generate theory in areas where little is already known, or to provide a fresh slant on existing knowledge about a particular social phenomenon.

Grounded Theory as well as other qualitative methods of human inquiry requires understanding of related theory and empirical work in order to enhance theoretical sensitivity (Flick, 2002; McGhee *et al.*, 2007; McCallin, 2003; Chiovitti and Piran, 2003). The Grounded Theory Approach is used in many fields, ranging from the study of software development processes (Coleman & O’Connor, 2007), to research on relational identity in intercultural friendships (Lee, 2006), to studies on beer consumption (Pettigrew, 2002). It is widely used in healthcare research and is particularly popular in the field of nursing (e.g. Artinian *et al.*, 2009; Coyne and Cowley, 2006; McCann and Clark, 2003).

In grounded theory, data is systematically and intensively analysed often phrase by phrase or sentence by sentence. There is constant comparison of different data to code and classify codes to form concepts and themes (Strauss 1987; Miles and Huberman, 1994). Bearing in mind the challenges of the grounded theory approach (Backman and Kyngas, 1999; Eaves, 2001; Alan, 2003), Dunne (2011) indicates that it is imperative that researchers who employ this methodology be well versed on the topic in order to take their own informed and defensible position on how to apply it. This is against the backdrop of a rift between the two original authors in the 1990s (Dunne, 2011).

Morse (2006) shared this opinion that introduction of any research methodology into the public domain leaves it open to being adapted and employed differently to how the originator(s) envisaged. This position was also supported by Strauss and Corbin (1994) [Noting that Strauss is one of the original authors of the 1967 version of the Grounded Theory approach]. Indeed, Johnson *et al.*, (2001) argued, mixed methods, including

grounded theory, does not necessarily compromise methodological ‘purity’, but can actually enhance rigour.

3.2.1.1 Generating theory

Theory has been considered as a set of well-developed categories (e.g. themes, concepts, ideas,) that are related through statements of relationships to explain some relevant social, psychological, educational, nursing, or other phenomenon or occurrence (Walker and Avant, 1988; Meleis, 1991; Balbie, 2007). The statement of relationships will usually explain who is doing what, at what period (when) and location (where), and the possible reasons and explanations for what is happening (why, how).

Developing theory is a process which involves not only thinking through and interpreting ideas (such as themes and concepts), but also formulating them into forms that are meaningful in relation to the objective of the study. It is important that the idea is explored fully and considered from different perspectives to deepen understanding (Strauss and Corbin, 1998). As the data are collected, it is suggested that they should be analyzed simultaneously by looking for all possible interpretations and meanings. This usually starts with open coding where the data is broken-up into different units of meaning. In addition to open coding, the researcher is encouraged to keep records (usually called memos) of ideas, insights, meanings and their corresponding interpretations which are showing up in the data collection and analysis. This is expected to help researchers to organize their thoughts to construct the emerging theory (Glaser and Strauss, 1967).

3.2.1.2 Elements of the theory

The elements of theory that are generated by comparative analysis are, first, concepts and then their corresponding categories or themes (theme and category are used interchangeably throughout). Both concepts and themes are indicated by the data (and not the data itself). The constant comparing of the concepts drew the researcher’s attention to their many similarities and differences. Related concepts were then grouped together to form a theme. Since the concepts and the themes were generated from the data, they will be important to a theory or explanations on perceptions, attitudes, and behaviour (Glaser and Strauss, 1967; Eaves, 2001; Douglas, 2003; McGivern, 2006).

Thus, the notes from the Focus Group discussions were written-up and synthesized for the four different discussions (mixed, men’s, women’s, and the young adults’ groups) in each community. Responses were then analyzed to identify ideas or patterns and then organized [grouping of similar ideas] into coherent concepts and themes to interpret the text. The issues which emerged are presented under chapters four, five, six, and seven. The process of analysis applied is presented below, drawing on the ideas from the Grounded Theory approach as discussed above.

3.2.1.3 Analyzing qualitative data from the field

In line with the grounded theory approach as presented above, and starting with one community, key points from the FGDs notes were identified and marked. The marked text was transferred to a Table which had three sections; an identification label of the statement which allows it to be traced back to the respective FGD notes and a section for codes which were created from the key points (Table 3.8). The codes were either words or phrases. At the second level of analysis, similar codes were grouped together as concepts and the concepts also grouped together at the third level of analysis into themes. The codes, concepts and themes were compared with the next set of key points from other FGDs from the communities. Similar codes, concepts and themes were noted while new ones were distilled from the FGD notes. Constant comparison of key points, codes, concepts and themes was employed throughout the analysis until all possible ideas have been synthesised from the FGDs notes [See an example from Abokobi-Pantang below in Table 3.8 and the detailed example in Appendix 3.7].

Table 3.8: Analysis of FGDs from Abokobi-Pantang: Access to Water

Identif ication label	Key point	Code
1Pc1	<i>“The Population was increasing in Pantang and there was only one source of water-</i>	Rising population, pressure on water resource
1Pc2	<i>So they [Pantang people] created a second “dugout” and called it “Buhe” [new dugout]”</i>	Surface water development
1Pc3	<i>“There is pipe born water, when the tap is not flowing then we resort to the dugouts</i>	Alternative source of water, access to treated water, supplementary use of surface water
1Pc4	<i>The flow is quite regular</i>	Regular supply of tap water
1Pc5	<i>“Most houses in Pantang lack water</i>	Limited connectivity

1Pc6	<i>There are three public stand pipes in the community where water is sold at a cost of 5 Ghana peswas/ size 28 bucket</i>	Limited public standpipes
1Pc7	<i>“The cost of connection to the pipe line depends on the extension</i>	Variable cost of connectivity
1Pm1	<i>We have access to water</i>	Access to treated water
1Pm2	<i>At Pantang we have ponds because we dug them</i>	Surface water development
1Pm3	<i>There are not individual pipes in Pantang- What pertains is community pipe. Majority of Abokobi people are not connected</i>	Limited connectivity
1Pw1	<i>“We have pipe connection and the source is ground water from Sesem--1</i>	Access to treated water
1Pw2	<i>There is rainwater harvesting into polytank</i>	Rainwater harvesting
1Pw3	<i>“From the earlier stages water sources for Pantang were rain water collected into barrels and ponds</i>	Historical use of rainwater
1Pw4	<i>“The Dakobi [river] is for washing, in the past it was for drinking, even right now some people drink it</i>	Changing use of river, current uses, past uses
1Pw5	<i>Tap water is regular</i>	Regular supply of tap water
1Py1	<i>Sources of water in Abokobi/Pantang include tap water</i>	Access to treated water
1Py2	<i>ponds were used for bathing, washing and other activities</i>	Historic use of surface water
1Py3	<i>At Pantang, when the taps are not flowing we use the ponds for washing and bathing-</i>	Current uses of pond

NB: C=mixed group/; m=men; w=women; y=young adults

The identification label links the key point back to the focus group discussion notes from where it was taken.

Concepts

Increasing demand for water	1Pc1
Surface water development for use	1Pc2, 1Pc3, 1Pm2
Regular supply of tap water	1Pc4, 1Pw5,
Access to treated water	1Pc3,1Pm1,1Py1
Limited and variable cost of connectivity to tap water pipelines	1Pc5, 1Pc6,1Pm3, 1Pc7
Rainwater harvesting as an alternative source of water	1Pc2, 1Pc3, 1Pm2
Changing use of surface water	1Pc2, 1Pc3, 1Pm2

Categories/ themes

Surface and other alternative sources of water 1Pc2, 1Pc3, 1Pm2; 1Pc2, 1Pc3, 1Pm2; 1Pc2, 1Pc3, 1Pm2
Access and use of tap water 1Pc1; 1Pc4, 1Pw5; 1Pc3,1Pm1,1Py1

The notes from the organisational interviews were first read through several times to understand what was happening in an organisation. A Table of strengths, weaknesses, opportunities, and threat (SWOT) was created for the analysis. Using the themes for the interviews, key messages were summarised in the Table. This was repeated for all the organisational interviews. The summaries from the various organisations were compared and linked with statements of relationships to explain the differences and similarities in organisational capacity, and, more importantly, what the organisations can do differently to improve the current water and environmental conditions.

The summaries and SWOT analysis were used for the organisational interviews because, unlike the FGDs notes, it was less about individual views or feelings and more about the state of the organisational capacity. The key informants presented information on the organisations. The sample size was also low and therefore the nature of diversity observed in the FGDs was not anticipated in the organisational analysis in terms of concepts and themes. The Grounded Theory application is more conducive when interpreting views, opinions, perceptions, attitudes, behaviour, among others as indicated above.

In order to understand the sources and nature of vulnerability, the analysis drew out aspects of the results which helped to explain vulnerabilities to which households are exposed. Further details on vulnerability are provided in chapter two, section 2.1.2.

3.2.2 Quantitative analysis of household questionnaires and water quality parameters

After the data from the field have been entered into a spreadsheet and quality checks carried out, there is a range of computer analytical software that can be used to analyse

the data. Some of the quantitative data analyses are: frequency counts; mean, mode, median (all measures of central tendency: measures average); standard deviation (variation from the mean); cross-tabulations (compare responses of different groups); significance test (test for statistical differences); chi square (test for associations); correlation, regression (suitable for testing for associations between two continuous variables); and factor analysis or principal component analysis (PCA) (suitable for summarising a large number of variables into a smaller set of variables to facilitate interpretation) (GAO, 1992; McGivern, 2006).

The choice of which analysis to run depends on the type of data and what the results are expected to indicate, and these two are also linked to the research questions. Quality checks were carried out on all administered questionnaires and when I was confident that standard procedures had been followed, the data was coded and entered into a spreadsheet in Excel. Quality checks were again carried out on the spread sheet to be certain that the correct data had been entered. The data was then transferred into a spread sheet in SPSS version 16 databases. Here too quality checks were conducted. A similar process was also followed for the quantitative water quality data. Frequencies, means, cross-tabulations, chi-squares, analysis of variance (ANOVA) and multiple comparisons were carried out on the data in line with the research questions of the study. Attitude statements from the communities were compared using the analytical package R to analyse for deviance [chi-square]. The results of all the analyses are presented in chapters four, five, six, and seven.

3.2.2.1 Using Principal Component Analysis [PCA] for Socio-economic Score Calculation

A mass of data had been collected on household assets ownership which had to be analysed in a way that will allow sound interpretation and understanding of the wealth status of households. The data included numbers of items of physical, financial and natural assets (e.g. presence of tap water, type of toilet) as well as human and social assets such as education and membership of community groups. The sheer size of the data makes it difficult to employ some of the other analytical techniques such as frequencies, chi-square, cross tabulations and others. This called for a technique to reduce the data to enable its interpretation in order to make a meaning out of it. This is where PCA comes in because it is able to reduce a large volume of data on household assets ownership by assigning weights which can then be used for further calculations

(Appendix 3.8). Through this, the data can be more readily interpreted and a meaning made out of it. This also allows for ease of data comparison.

Principal Component Analysis (PCA) is a 'data reduction' procedure. It is useful when data have been obtained on a number of variables (possibly a large number of variables such as the household assets in this study), and it is believed that there is some redundancy in those variables. In this case, redundancy means that some of the variables are correlated with one another. Thus, it should be possible to reduce the observed variables into a smaller number of principal components (weights) that will account for most of the variance [differences] in the observed variables (the data from the field).

In this research, the output of PCA is a table of scores or weights for each variable. In general a variable with a positive weight is associated with a higher socio-economic status (SES), and conversely a variable with a negative weight is associated with lower SES. This means that all things being equal, a household with an asset giving a negative score will be ranked lower in terms of SES than a household without such an asset. Using the first principal component [first set of weights], a dependent variable was then computed for each household (Y) [Socio-economic score] which has a mean equal to zero and a standard deviation equal to one.

This dependent variable can be regarded as the 'socio-economic' score, and the higher the household socio-economic score, the higher the implied SES [Socio-economic Status] or wealth of that household. This is because assets ownership of a household influences the SES. Households with high socio-economic status are able to afford more of these assets.

If the first principal component [set of weights] explains a small proportion of the total variance [difference in the data set], each higher order component will explain a smaller proportion still. Therefore using two or three different sets of weight may not significantly improve the proportion of the total variance explained.

In this particular study, the first and second PCA [set of weights] were found to be relevant and therefore used to compute the socio-economic scores one and two of each household. This was followed with mean socio-economic scores one and two for the

respective selected communities. The results are presented in chapter four (see Appendix 3.9 for further details on the PCA application).

3.2.3 Advantages of using mixed methods in the study

The notion of mixed methods means that both qualitative and quantitative methods were employed in the investigation as has been discussed above. As an interdisciplinary study, there was a need for methods which could complement one another such that the weakness of one will be responded to by the other. Qualitative methods helped to collect data on opinions, feelings, perceptions, behaviour, which otherwise would not have been possible with quantitative methods. The semi-structured nature of the qualitative data collection allowed probing questions to explore particular phenomenon in the water and environment sectors.

The fact that people were allowed the opportunity to express themselves in qualitative research meant that they could freely provide ideas, unlike quantitative methods which restricted what information had to be provided. This enabled people to contribute in ways that could not be covered with the quantitative research methods. Qualitative methods therefore helped to probe deeper into the social environment of the communities, upon which the understanding from the analysis of the qualitative data is based.

The combination of qualitative and quantitative methods meant that certain relationships which neither of the methods alone could explain better, were now possible to explore. Furthermore, the range of qualitative data analysis of the FGDs helped to generate meaning and understanding, especially the grounded theory approach, which ordinary summaries could not have achieved. The SWOT analysis was useful in helping to understand some of the organisational capacity. The flexibility of the qualitative methods and analysis made it possible to vary the process as insights emerged from the field. Quantitative data analysis helped to test association and differences for significance. Large amounts of data were reduced to smaller number of values which aided interpretation and made comparisons possible.

The quantitative method also helped to measure specific information, for example the income contributions of water dependent occupation to households. This meant that certain measurements which the qualitative methods could not have achieved were

carried out by the quantitative method. Using the quantitative methods, some information from the qualitative methods was triangulated in a wider population.

The mixed methods also meant that different types of data were generated. The process of analysis and interpretation to explain the findings deepened understanding of the issues at stake. The combination of both qualitative and quantitative methods was useful for answering the different combination of research questions.

3.2.4 Research ethics

The research was conducted in line with the code of research ethics of the Natural Resources Institute, University of Greenwich. Permission was sought at all stages of the research: initially from the community leadership where necessary; then from participants of focus group discussions, respondents to the household questionnaire interview, and key informants in organisations. The nature of the research and the nature of the discussions and questions to be asked were explained to participants. What was expected from all participants was also clarified. The purpose of the study and who was carrying out the research was explained to participants. In terms of funding for the research, it was indicated to participants that the research was funded by a project. It was explained that the results of the investigation could assist policy makers in planning for water and other environmental services provision and management. It was made clear to all potential participants that their participation was voluntary and that they could withdraw at any time. During field work some prospective participants opted out of the FGDs and were allowed to go. Some new participants were invited to join. Children were not involved in the research. Households which declined to participate in the survey were allowed to do so. All those who participated in the research did so voluntarily.

3.3. DESCRIPTION OF ACCRA

In chapter one (see section 1.3.2), an initial description of Accra was presented. This section presents information on the climate and vegetation of the city as well as some socio-economic characteristics and administrative arrangements.

3.3.1. Climate, vegetation and soils

Accra the capital of Ghana is a coastal city with a dry equatorial climate. The Accra metropolitan Assembly (AMA) covers an area of 17,362 ha (Figure 1.2). The city is characterized by the coastal savannah vegetation type, which is made up of shrubs with isolated trees mainly the neem. It is the city that receives the least amount of rainfall in Ghana averaging 810 mm distributed over less than 80 days. The rainfall pattern of the city is bimodal with the major season falling between March and June, and a minor rain season around October. The climate is generally hot and humid, with mean temperatures lying between 24 °C in August and 27 °C in March. However, relative humidity is high throughout the year, thus compensating for the scanty annual rainfall (Obuobie *et al.*, 2006; Dickson and Benneh, 1995).

The soils of Accra can be divided into four main groups: drift materials, alluvial and marine mottled clays (that is clays with different shades of colours), residual clays and gravels and lateritic sandy clay soils. In many low lying poorly drained areas, pockets of alluvial black soils are found with high organic matter content, which may cause major problems with foundations and footings. In some areas, lateritic soils are strongly acidic and when saturated are likely to attack concrete foundations causing honey combing (AMA, 2002). In spite of urbanization some open spaces in Accra are used to cultivate food crops like corn, okro, tomatoes, lettuce, green pepper, carrots, and other vegetables.

3.3.2. Socio-economic characteristics

Accra has been Ghana's capital since 1877 (Ghana Statistical Service, 2002). The economically active population of Accra was estimated to be 823,327 in year 2000 (Ten years later it is expected that the current figure will be higher than this). However, the daily commuters from dormitory towns make the figure higher than estimated. Accra is a major centre for manufacturing, marketing, finance, insurance, transportation and tourism.

The other activities include farming, fishing, quarrying, and utility services provision such as electricity, gas, and water. There are also those in the hospitality industry and trading of goods and wares. As an urban economy the service sector is the largest, employing about 531,670 people (again as at year 2000). Accra had 114,198 of its

labour force unemployed as at year 2000. Primary production in Accra employed 91,556 people (Table 3.9) as at year 2000. As a metropolitan area and coastal city, the predominant primary economic activity is fishing and urban agriculture (Table 3.9).

Table 3.9: Productive labour force in primary production

Sub-Sector	Figure	Percentage
Urban Agriculture	20,342	22
Fishing	71,214	78
Total	91,556	100

Source: AMA, 2002.

In relation to standard of living, the Ghana Poverty Reduction Strategy, 2002-2004, indicates average annual income per capita can range from \$1,519.82 to \$8,000. The city Gross Domestic Product (GDP) per capita is \$915 compared to the national average of \$350.

3.3.3. Administrative Structure

The Accra Metropolitan Assembly (AMA) is the highest political and administrative arm of the Government at the local level. The full membership of the Assembly is 104; of this, 70% are elected and 30% are appointed by government. The AMA through the Local Government Act 462, 1993 (Section 10 Subsections 1,2,3,4 and 5), carries out the legislative, deliberative and executive functions of Government.

The functions of the Accra Metropolitan Assembly are outlined in the Legislative Instrument (L.I. 1500) which established the AMA. The AMA is further divided into 11 sub-metropolitan district councils ([http:// www. ghanadistricts. com/ districts/ ?r=1& =3 &sa=3037](http://www.ghanadistricts.com/districts/?r=1&=3&sa=3037); Retrieved 09/11/10). These wider city contexts are more easily understood when some of the issues in the specific communities are considered.

3.4. BACKGROUND ON SELECTED COMMUNITIES

The specific characteristics of the selected communities in the various categories which were observed during field trips are presented below. This was to create an understanding of the context of the research within each community.

3.4.1 Peri-urban

Two communities, Abokobi-Pantang and Agbogba fall within this category, as indicated above. These two are described below.

Abokobi-Pantang

Abokobi-Pantang is a peri-urban community inhabited by multi-ethnic people. The location of the community is at the rural/urban interface. People in this community are involved in various types of occupation such as farming [rain fed] of cassava, maize, and yam, plant nurseries, food vending, civil service, masonry, electronics, block making, manual stone quarrying, driving, hair dressing, seamstress, trading, catering, among other activities.



Plate 3.1 Sections of the Odaw-River above; one of the ponds, lower left and a road crossing the river at Abokobi-Pantang

It is a sparsely populated community, however, it has a rich social network including, religious, occupational and other economic networks. In terms of governance, the

community is administered by the Ga-East district Assembly (see Figure 1.2) because it lies outside the official boundary of AMA, but in terms of urbanization, it is perceived by people to be part of the economy of the AMA. Some of the people living here commute to work in Accra.

Land use patterns include residential and farming. The building type is mixed-concrete and local bricks (see Plate 3.2). Some of the buildings are also walled. In the community roads are largely untarred (See Plate 3.1 and 3.2). The Odaw-Korle River flows through the community. The banks of the river have vegetation and are thus likely to control erosion at this section. The declining state of the water quality (in terms of safe use) is attributed to the influence of urbanization.



Plate 3.2: Abokobi-Pantang: Different sections of Abokobi-Pantang

Agbogba

Agbogba is a peri-urban community with typical peri-urban features. The community is inhabited by people from different ethnic groups. Although community members live at peace and maintain a cordial relationship with one another; there are no known associations in the community. As a peri-urban community, there are many green spaces especially along the river course, similar to Abokobi-Pantang. Community members are

engaged in various types of occupation which include water tanker operating, pure water vending, water vending, farming, construction, mechanics, salaried work, teaching, trading, civil/public service, and other private sector activities.



Plate 3.3: Section of Agbogba and a channel which transports wastewater and run-off to the river

Land use is mainly residential. Since it is a peri-urban community, it is administered by the Ga East District Assembly. It is an appreciably built up area. Some people have built within 5-8 meters of the river banks (see plate 3.4). The majority of the buildings are concrete and comparable to those of communities with high infrastructure provision. Some of the water sources are shown on Plate 3.4.



Plate 3.4: Some water sources and a section of the road in Agbogba

3.4.2 High infrastructure provision and environmental quality

Three communities are in this category, Abelemkpe, Dzorwulu and Kokomlemle. These are described briefly below.

Abelemkpe

Abelemkpe is one of the communities of Accra (see Plate 3.5). It is a multi-ethnic community with few social networks. There are churches and mosques in the community. There is a significant amount of commercial activity in some of the streets in the community. Some are salaried workers or self employed and are in various types of activities such as water vending [tanker operating or from taps], washing bay operating, fruit juice production [pineapple juice]; block making, pure water vending [sachet water], restaurant operating, small scale food vending, hairdressing, hospital and hotel staff, civil service, teaching, driving, computer technicians, professionals, and artisans among other activities.



Plate 3.5: A section of Abelemkpe

Abelemkpe is administered by the AMA. The land use pattern of the community is mainly residential and commercial.

Dzorwulu

Similar to many communities with high infrastructure provision in Accra, there are not many associations in the community, although community members live cordially with one another with limited interactions between neighbours. The youth appear to interact more than the adults. Community members are involved in various types of activities such as washing bays, staff of mineral water producing company [Voltic], laundry staff, restaurant staff, small scale food preparation and sale, hairdressing, salaried work, staff of waste management company [Zoomlion], night security, taxi driving, building contracting, trading, drinking spots attendants, gambling, tailoring, hospital and hotel staff. Some are also involved in salaried work. Land use is mainly residential (see Plate 3.6), commercial, and urban vegetable farming by non community members.





Plate 3.6: Sections of Dzorwulu

Kokomlemle

The community is highly multi-ethnic. The community lies more or less on the boundary of the inner city and is a highly commercialized area among the three communities with high infrastructure provision. There are some social networks in the community and community members are said to live cordially with one another. People in the community are into occupations such as food sale, porridge sale, salaried work, teaching and other professions, commercial car driving, trading, masonry, carpentry, painting, tailoring, graphic designing and printing, secretarial work, civil service, trading, sewing, and hair dressing. The community is administered by the AMA. Land use is residential (see Plate 3.7), commercial, educational, and financial among others.



Plate 3.7: Sections of Kokomlemle

3.4.3 Medium infrastructure provision and environmental quality

Two of the selected communities fall within this category, Nima and Alajo as indicated above. Nima is a very big community in terms of spread and population. It is a multi-ethnic community with large populations of Muslims and Christians who live together. It is a high density area and is less organised as compared to other localities. The Nima highway is full of commercial activity (see Plate 3.8). The majority of occupations are within the informal sector and include car washing, informal laundry services, hairdressing, food sale, water sale, security jobs, salaried work, driving, civil service, business, handicraft and art work production and sale, pure water sale [sachet water], batik tie and dye cloth production, carpentry, masonry, mechanics, welding, tailoring, sports men, electrician, trading, among other activities.



Plate 3.8: Sections of Nima

Nima is administered by the AMA. Land use pattern is residential, commercial, educational, and religious among others.

Alajo

This is a multi-ethnic community. People in this community are involved in various types of occupations such as commercial bathroom operation, food preparation and vending, hair and beauty business, salaried work, security, civil service, teaching, factory hands, construction contracting , barbering, commercial car driving, mechanics, tailoring, carpentry, waste management [staff of Zoomlion, a private waste management company], trading, sewing, and general artisanship.



Plate 3.9: Sections of Alajo

The community is administered by the AMA. Land use is mainly residential and commercial. There are various mosques and churches.

3.4.4 Low infrastructure provision and environmental quality

Three communities fall within this category, Abofu, North Industrial Area, [Avenor], and Sabon Zongo.

Abofu

Abofu is a multi-ethnic community near Achimota [another community under AMA]. People in the community are engaged in various types of occupations such as pure water [sachet water] sale, ice water sale, apprenticeships, food preparation and sale, salaried work, civil service, self employment, artisanship, factory hands at other locations, clerks, masonry, security work, driving, support to their wives business, administrators, contractors, car sale. The community has several churches, a basic school, and a mosque. The community is administered by the AMA and it is separated from Abelemkpe by the Accra-Tema Motor way extension. The land use pattern is mainly residential, with some educational, health and religious infrastructure.

North Industrial Area (Avenor Area)

This is a multi-ethnic community where the majority of the households are ‘Gas’ [indigenes of Accra]. People in this community are involved in activities such as food vending (kenkey), hair dressing, salaried work [few], driving, carpentry, painting, industrial work, teaching, masonry, cleaning, security, mechanics, shoe repair, tailoring, barbering, milling, teaching, salaried work, trading, fish smoking, and sewing. There is low school enrolment in the community. The community is situated in an industrial area. There is a perception that a lot of social vices - drugs, prostitution, among others, pervade the immediate surroundings of the community. The community is governed by the AMA. The community is spatially disorganised. Land use is mainly residential and religious.



Plate 3.10: Sections of North Industrial Area [Avenor]

Sabon Zongo

The community is located near the Korle Lagoon. It is a multi-ethnic community but the majority of the inhabitants are Muslims. People in the community are engaged in various types of occupations such as food preparation and sale, pure water sale, hair dressing, security work, salaried work, commercial car driving, barbering, business, trading, herbal medicine production, fabric designers, livestock keeping, metal scrap collection, farming , plastic recycling, tailoring, mechanics, electronics, car spraying, football players, work with a waste management company, among others. It is administered by the AMA. Though residential, small-scale commercial activities can be seen in almost every street in the community. The nature of the building is a mix of concrete and local brick material (see Plate 3.11). The community is spatially disorganised, but at least there are some roads in the community, none of which is tarred.



Plate 3.11: Sections of Sabon Zongo

3.5 SUMMARY

The criteria needed to select the communities were presented in line with the research questions. An overview of the classification within the city was presented. A brief description of the sampling framework was presented.

There were initial community interactions which helped shape some of the general questions for the interviews. The purpose of the FGDs was also well defined in line with the research questions of the study. Prior to the FGDs, contact was made with the prospective study communities and the participants. These participants were given a briefing of what the research entailed and given the free will to participate or opt out. A protocol for the discussion was developed where the researcher facilitated the

discussions and took notes. After each FGDs, reflections were carried out and memos written on each discussion. A justification of the FGD method that was used was presented, along with its limitations (participants relied on re-call, some may have exaggerated etc.). With this in mind, some responses were triangulated.

The criteria that were used in arriving at the ten organizations selected for interviews were presented. The criteria were based on the importance and influence of the organizations in relation to water and environmental management. Standard procedures were used for field water sampling and laboratory analysis. Also presented was the theoretical and procedural background to the systematic approach used in generating explanations from qualitative study.

Reference was made to grounded theory, from where some of the ideas were obtained to analyze the results of the interviews. Reference was made to the fact that qualitative approaches are used to analyze data systematically to construct concepts and themes that are meaningfully connected to develop explanations to phenomenon. Thus, concepts and themes were generated from the notes of the FGDs.

An overview of the quantitative analysis was presented with some of the reasons for such analysis. The data collected from the household interviews and the water samples were subjected to standard quantitative analysis using the SPSS (the SPSS package also runs the PCA analysis) and R analytical packages.

Brief background information on Accra and the selected communities were presented. The results from the analysis of the data collected are presented in the subsequent chapters, starting with water, livelihoods, and poverty in chapter four.

CHAPTER FOUR : ACCESS TO WATER AND ITS CONTRIBUTION TO HOUSEHOLD LIVELIHOODS.

Chapter four presents findings relating to the first research question - **How does access to water for domestic and productive uses affect households and their well-being?**

The chapter begins with a discussion of access to water within the city and the challenges encountered by communities across different levels of infrastructure provision and environmental quality by city classification. Specific water challenges relating to the connectivity, regularity, quality and cost are discussed. This is followed by discussions on the uses of potable water for both domestic and commercial activities and the latter's specific contribution to household income. The current prospects for using surface water for various activities in the communities are also presented and the complementary role of surface water use is considered. Since water dependent occupations are part of the wider occupational activity of the communities; an analysis of the factors underpinning individuals' choice of occupations is presented.

The communities' understanding of well-being is presented, drawing on local perceptions of wealth and poverty. The presentation is structured using the major themes and concepts or ideas which were distilled from the analysis of the focus group discussions in the selected communities, and informed by the definitions of assets in the livelihoods framework. The results of the household questionnaire interviews are also integrated throughout. In the presentation, themes are **bold typed** whereas concepts or ideas are in *italics* and indicated accordingly (see section 3.2.1. to 3.2.1.3; Table 3.8; and Appendix 3.7; on how the focus group discussions were analysed). Where data is disaggregated by sex of household head, the test of significance will be shown where it is significant. In chapter four, the level of significance was set at $p < 0.05$.

4.1. ACCESS AND CONNECTIVITY TO WATER SUPPLY

This section integrates the analysis of the focus group discussions and the household interviews.

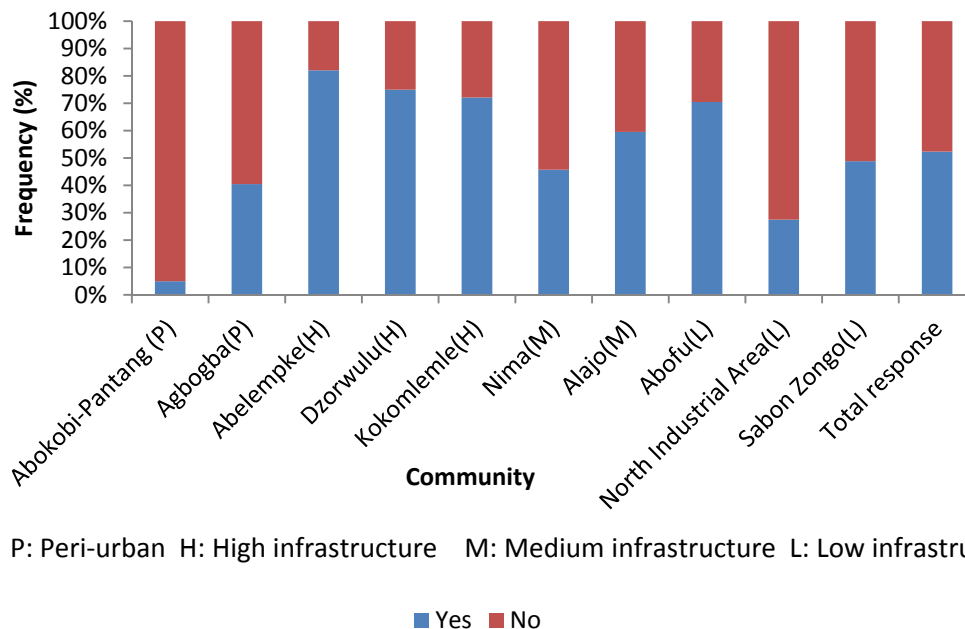
4.1.1 Access to water

Water is often said to represent life and indeed it is unimaginable how difficult life would be without access to water sources. The advent of urbanization has introduced

key challenges to both the urban and the peri-urban areas of cities. Since many more people are living in the peri-urban communities, treated water supplies are in high demand, and there is *increasing demand for water and access to treated water (concept)*. Since there are many new residential settlements in the urban and especially the peri-urban areas, not all households have access to tap water supplies. This was evident in some peri-urban communities where the majority of houses are not connected (Figure 4.1), and the communities are characterized by *limited connectivity of tap water (concept)*, as observed in discussions in Abokobi-Pantang and Agbogba and confirmed in the household interviews.

For people who are not connected, it is not necessarily because they are unable to afford the cost of connection, but the Ghana Water Company Limited /Aqua Vitens Rand Limited (GWCL/AVRL) pipe lines may not extend to the section of the community where their houses are located. Though limited connectivity is a problem in the peri-urban areas, Abokobi-Pantang and Agbogba, it is also common in some parts of Accra. Overall there was *limited and variable cost of connectivity to tap water pipelines (concept)*.

Figure 4.1: Tap water connection in houses



[Table in Appendix 4.1].

The development of residential settlements tends to be ahead of water infrastructure provision and this is a source of problems in access to water in communities. In

communities where the water supply pipelines have been laid, the procedures to follow in order to be connected are considered time demanding and bureaucratic by community members. The number of applicants in the queue and the total cost of the connection determines the duration between the request for tap water connection and the time it is granted. The connection fee is not fixed but variable because distance from a person's house to the supply point in the community determines the total cost of the connection.

There can be no tap water connection for households which cannot afford to pay. The majority of houses in Abelemkpe, Dzorwulu and Kokomlemle (all communities with high infrastructure provision) were connected to the tap water supply (Figure 4.1). This may enable people to access water at the right time and in the right quantities for their domestic and economic activities.

Up to half of the households interviewed in the medium infrastructure provision communities of Nima and Alajo (Figure 4.1) have a tap water connection. In the low infrastructure provision communities, about half (48.2%) of the households in Sabon Zongo, and a little over 30 % of households in North Industrial Area indicated the presence of a tap water connection in their houses. Though Abofu is also a community with low infrastructure provision, there was a high rate (70.5%) of tap water connection. The majority of houses (76.8%) in the peri urban communities, Abokobi-Pantang and Agbogba, had no tap water connection. There was a statistically significant relationship between location and presence of tap water connection in houses (χ^2 , 9df=85.065, p=0.000). This means that when the proportions of households connected and not connected in each community are compared with other communities, the differences are significant.

In the entire sample (N=443), 52.4 % (232) and 47.6% (211) of households lived in houses with and without tap water connection respectively (Figure 4.1). The total proportion with access to water supply in the sample is slightly higher than the estimate from the 2000 Population and Housing Census of Accra which indicated that 43.6% of households accessed water from their house connections (Ghana Statistical Service, 2002). Table 4.1 presents a cross tabulation of the presence of tap water by category of community and by gender of household head. There was a statistically significant difference between the category of communities in relation to presence of tap water in houses (χ^2 , 3df=56.358, p=0.000). The majority (76.2%) of houses in the communities

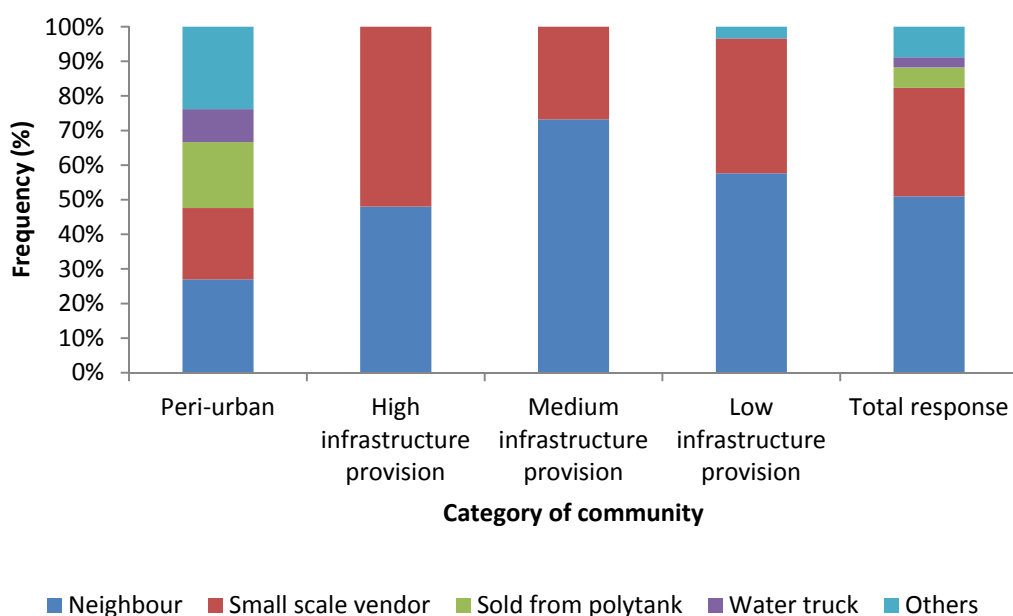
with high infrastructure provision were connected; up to 50% of houses in the communities with medium and low infrastructure provision were connected, but only 23% of houses in the peri urban areas were connected.

Table 4.1: Presence of tap water connection in houses by gender

Category of community	Presence of Tap water connection	Gender of household head (%)		
		Men	Women	Total response
Peri-urban	Yes	24.3 (18)	12.5 (1)	23.2 (19)
	No	75.5 (56)	87.5 (7)	76.8 (63)
	Total	100 (74)	100 (8)	100 (82)
High infrastructure provision	Yes	75.5 (71)	78.6 (22)	76.2 (93)
	No	24.5 (23)	21.4 (6)	23.8 (29)
	Total	100 (94)	100 (28)	100 (122)
Medium infrastructure provision	Yes	48.9 (44)	59.1 (13)	50.9 (57)
	No	51.6 (46)	40.9 (9)	49.1 (55)
	Total	100 (90)	100 (22)	100 (112)
Low infrastructure provision	Yes	48.1 (39)	52.2 (24)	49.6 (63)
	No	51.9 (42)	47.8 (22)	50.4 (64)
	Total	100 (81)	100 (46)	100 (124)
Total response	Yes	50.7 (172)	57.7 (60)	52.4 (232)
	No	49.3 (167)	42.3 (44)	47.6 (211)
	Total	100 (339)	100 (104)	100 (443)

Households living in houses without a tap water connection had to fetch water from a variety of sources (Figure 4.2), with neighbours and small-scale water vendors being the most important sources. In the overall sample (204), 54% (104) of those not connected bought water from neighbours' taps; 31.4% (64) bought water from small-scale vendors; 5.9% (12) bought water from people who sold water from polytanks; 2.9% (6) bought water from water tankers or trucks and 8.8% (18) bought water from other sources.

Figure 4.2: Sources of water for households living in houses not connected to tap water



[Table in Appendix 4.2]

Another problem affecting water supply in some communities is the fact that some individuals illegally connect to the pipelines of legitimate customers and draw water. This was common particularly in Nima. In some cases people mount pumps on pipelines and steal water to fill their tanks and sell to community members. This poses problems for access to water in Nima. It also contributes to loss of revenue to the Ghana Water Company Limited/Aqua Vitens Rand Limited (GWCL/AVRL) [see chapter 7 for recommendations to address the problem].

Illegal connections to others' lines were also discussed by the young adult's focus group in Abofu:

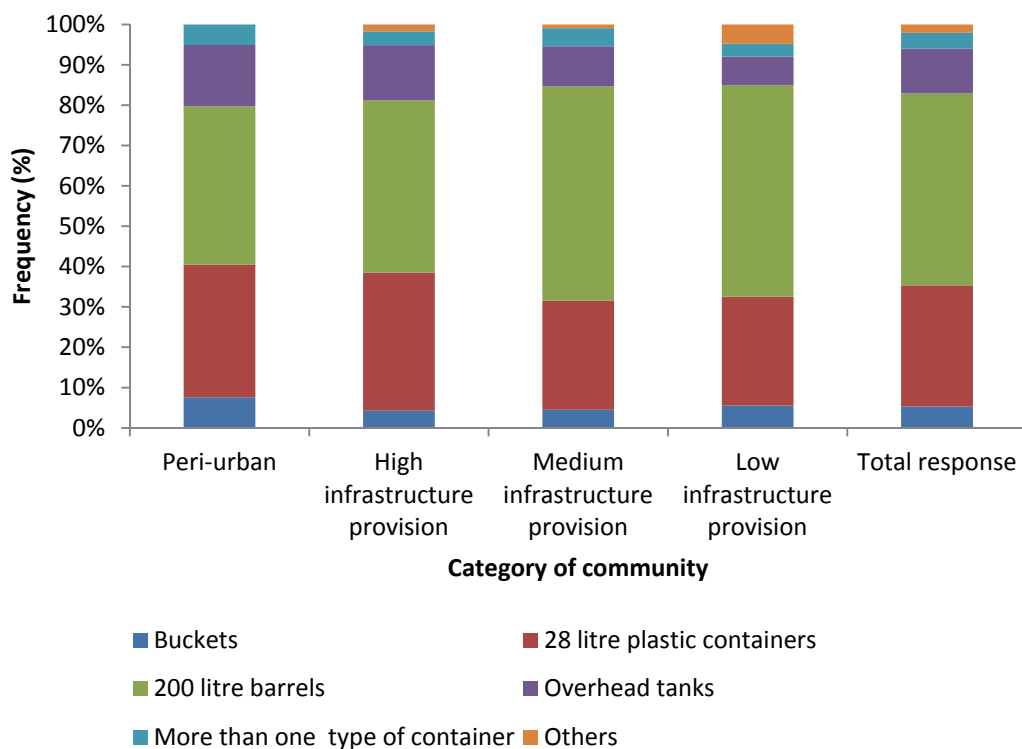
'Some people illegally connect to others' lines, making it difficult for legitimate customers to access water'.

In North Industrial Area (low infrastructure provision), it was difficult for people to connect to the Ghana Water Company Limited/Aqua Vitens Rand Limited pipeline because of the layout of buildings. The buildings have not been properly planned; there are no roads through the community except the main road which borders it. People were of the opinion that it makes the cost of connection expensive because the pipelines have

to be directed through places in between buildings. In some cases, there is no space for the pipelines.

In all ten communities, households store water as a measure for unscheduled breaks in water supply or for lack of tap water connection (Figure 4.3). Figure 4.3 shows that 28 litre plastic containers, 200 litre barrels and overhead tanks are important storage facilities. Although very few households used overhead tanks, the proportion of these households was more frequent in the peri-urban and communities with high and medium infrastructure provision for possible reasons of cost and space. In the peri-urban area and communities with high and medium infrastructure provision, some households have the capacity to afford the cost of buying the tank and raising a platform for it. Some of the houses have their own compound which makes it possible to access the needed space. Figure 4.3 shows that 200 litre barrels are the most commonly used means of storing water with 28 litre containers as second most commonly used.

Figure 4.3: Mode of storing water in selected communities in Accra



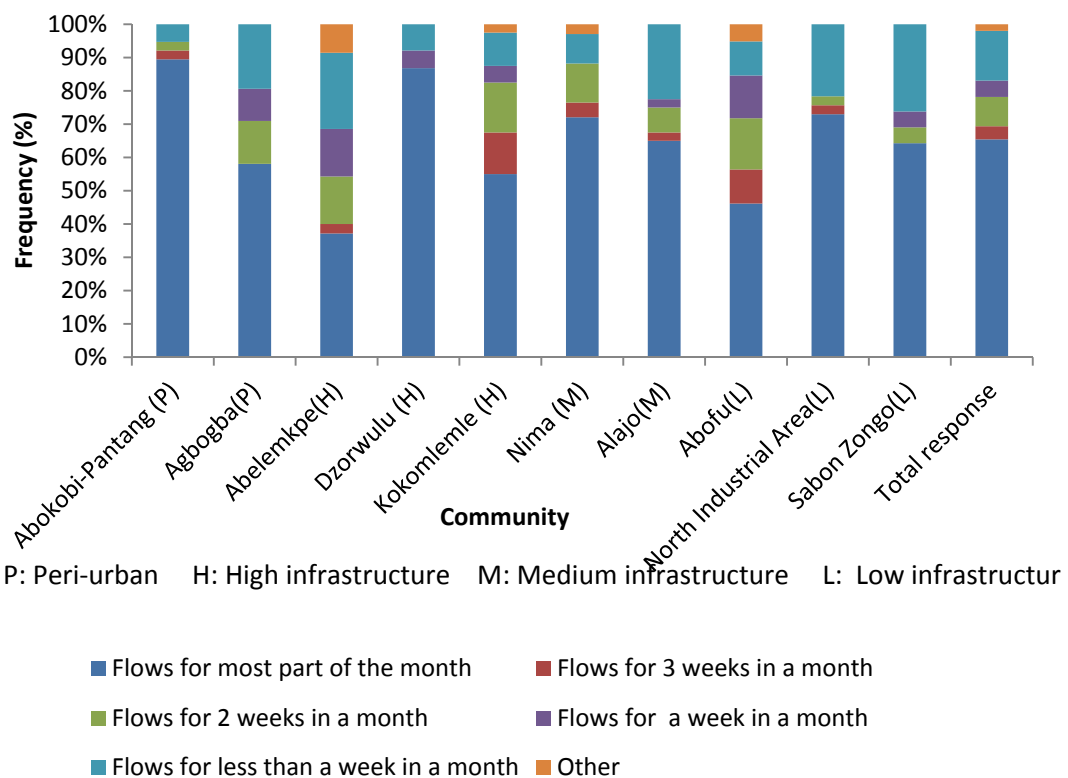
[Table placed in Appendix 4.3]

4.1.2 Regularity of Tap Water Supply

Tap water supply is unpredictable and shows no pattern across the various levels of infrastructure provision in the communities. This is because water supply in the city and

its peri-urban communities is rationed. Some communities have regular supply while others do not and this presents some problems. Abokobi-Pantang is a community where water supply was said to be regular whereas it was somehow irregular at Agbogba (also a peri-urban community). The situation was worse for some houses in Agbogba where there had been no tap water supply for some years. There were mixed perceptions concerning the regularity of the water supply in Abelemkpe, Dzorwulu and Kokomlemle (high infrastructure provision communities) (Figure 4.4). This variation is reflected in the comments from the mixed focus group at Abelemkpe: *‘The water flow could be said to be regular’*; and Dzorwulu: *‘The majority of people have tap water in their homes and the flow is quite regular’*, in contrast to the view of the women’s focus group in Abelemkpe: *‘Flow of water is irregular’*. This indicates that there was no consensus on regularity in Abelemkpe.

Figure 4.4: Community perception of regularity of tap water flow



[Table in Appendix 4.4]

The results of the survey showed both Nima and Alajo (both medium infrastructure communities) having appreciably high levels of regularity (Figure 4.4). There has been a water problem in Nima dating back many years, but it appears that there have been some improvements in recent times.

Regularity of water supply in Accra should be reported with caution and the specific period indicated, because of its variation over time. A community reporting regular water supply at one time may report irregular supply at a later period (seasonality of water supply). Although some places are considered to have regular water supply, it does not exclude them from occasional unscheduled closures lasting up to three days or thereabouts.

For households without adequate storage capacity, an unscheduled closure of the tap water supply implies a challenge of looking for water. Though connectivity is high in Kokomlemle (high infrastructure provision), there were a few houses which were known to have had no water supply for two years and more, but efforts made to get the Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] to rectify the problem had not yielded any fruitful results. It is important to note that among the three communities with high infrastructure provision, it is only in Dzorwulu where water supply was said to be regular.

The problem of irregular water supply was related to a second problem - faulty pipelines – to which the response of GWCL/AVRL was considered by community members to fall below their expectation. The position presented by the GWCL/AVRL was that faults on pipelines are often reported to them quite late since people fail to report cases at the appropriate customer service centres (or other GWCL offices) [from an interview with a key informant in the organisation; further discussion in chapter 6]. The GWCL/AVRL relies on feedback from the public to address leakages on pipelines and therefore if there is a leakage in any part of the city which is not reported to the GWCL/AVRL on time, then water supply may be lost for a while.

Furthermore, there were issues of low water pressure in Abelemkpe and Dzorwulu (both high infrastructure provision communities) which implies spending a longer time in accessing water, unless the water is directly connected to overhead tanks. In the case of Abelemkpe, it was suggested that this low pressure was not a GWCL/AVRL problem, but a local one, because of the activities of some water tanker drivers in the community who were suspected of drawing water from the main supply pipeline in the community. Several factors could account for low flow pressure of water in communities and the GWCL/AVRL is well placed to indicate the exact cause of the problem with the water

supply system. It is therefore one issue that the GWCL/AVRL will have to consider addressing among other problems that confront the company.

In communities such as Nima where about half of the houses are connected to tap water (Figure 4.1), it should be noted that the high level of perceived regularity was related to the availability of tap water at water selling points, or from a neighbour's connection, or water retailed from polytank and not only from in-house tap water connection.

In the case of Abofu where the water supply was somewhat irregular (Figure 4.4), community members have to take appropriate measures to obtain water for their activities. As in the focus group discussions in Abofu:

'The flow of water is irregular'. 'The water was regular last year but this year it is irregular'. 'I suffer to get water from the surrounding communities; and the cost of water also goes up outside the community'.

However, the water supply was largely regular at North Industrial Area and Sabon Zongo (all low infrastructure communities) (Figure 4.4) and therefore people can access water from neighbours' taps.

In circumstances of irregular water supply, people must learn to store water otherwise when the taps do not flow, they may have to go out in search of water. The water may flow at a time that people are asleep and therefore those who are unable to wake up and fetch water, may not have enough for their daily activities. During periods when the water supply stops, the cost of water may increase at places where water is sold. Unscheduled stoppages in tap water supply are a problem within the city even in places where water supply is said to be regular. People have to move outside the community to look for water, possibly walking long distances, if they have no stored water or cannot get stored water to buy.

Further problems are associated with unscheduled stops in water supply. The quality and quantity of water dependent occupations are also affected in terms of the services and the products. Operations of public toilets are affected in terms of the charges and the hygienic conditions.

4.1.3 Layout of Pipe Network and the Risk of Water Contamination

Informants in the FGDs, reported occasions in which wastewater intrudes into pipe networks connecting water to people's houses. This is closely related to the attitude of the Ghana Water Company Limited/Aqua Vitens Rand Limited to broken pipelines (discussed under connectivity of tap water above). Such breaks are also sources of leakages to the company. As wastewater enters broken water supply pipes, the water may become contaminated, though the extent of contamination is unknown. A further possible explanation is that wastewater intrusion into the pipelines is because the pipelines are disorganised, running through drains (wastewater channels) and water logged areas in some cases. The pattern of the network is indeed a health concern. Since there is a deficit in the city water supply, ensuring that leakages are blocked would help save water for communities with limited connectivity as well as safe guarding the health of the city's people.

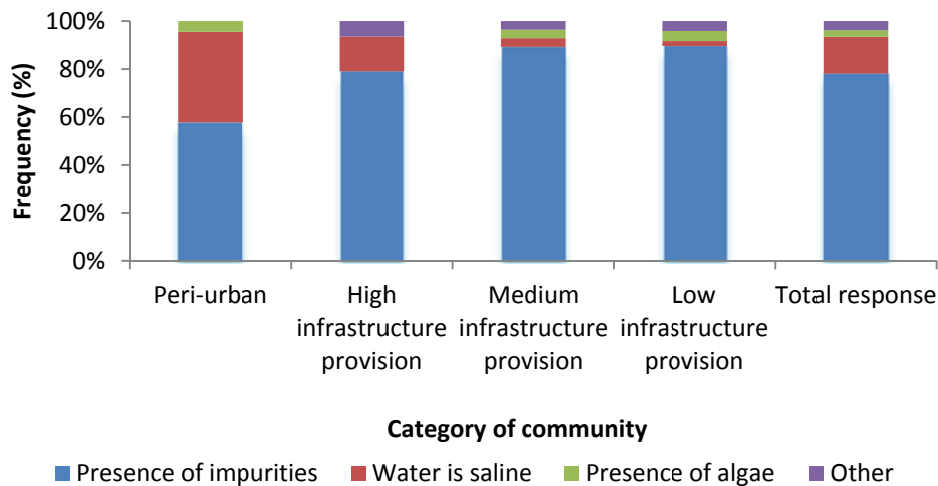
Table 4.2 presents the frequency of satisfaction/dissatisfaction with water quality in the communities while Figure 4.5 indicates the nature of the water quality problems.

Table 4.2: Satisfaction with water quality

Category of community [with N in parenthesis]	Response	Men	Women	Total response
Peri-urban [82]	Yes	50.7(36)	87.5(7)	54.4 (43)
	No	49.3 (35)	12.5(1)	45.6(36)
	Total	100(71)	100(8)	100(79)
High infrastructure provision [122]	Yes	52.2(47)	58.3(14)	53.5(61)
	No	47.8(43)	41.7(10)	46.5(53)
	Total	100(90)	100(24)	100(114)
Medium infrastructure provision [112]	Yes	29.2(26)	31.6(6)	29.6(32)
	No	70.8(63)	68.4(13)	70.4(76)
	Total	100(89)	100(19)	100(108)
Low infrastructure provision [127]	Yes	44.2(34)	33.3(15)	40.2(49)
	No	55.8(43)	66.7(30)	59.8(73)
	Total	100(77)	100(45)	100(122)
Total sample surveyed [443]	Yes	43.7(143)	43.8(42)	43.7(185)
	No	56.3(184)	56.2(54)	56.3(238)
	Total	100(327)	100(96)	100(423)

There was a statistically significant difference between the category of communities in relation to satisfaction with water quality (χ^2 , 3df=17.462, p=0.001) such that the majority of respondents living in high infrastructure communities said yes, they were satisfied with their water quality, whereas the majority of respondents living in medium (70.4%) and low (59.8%) infrastructure communities said no. In all four categories of communities, the presence of impurities in tap water was an important issue for all households (Figure 4.5). Salinity levels were important for households in the peri-urban communities who indicated that the water source for some sections is tapped from rocks in a mountain and channelled into the community by the Ghana Water Company Limited/Aqua Vitens Rand Limited. There are two rivers: the Densu and the Volta river systems, which are treated to supply Accra.

Figure 4.5: Nature of the water quality problem



[Table placed in Appendix 4.5]

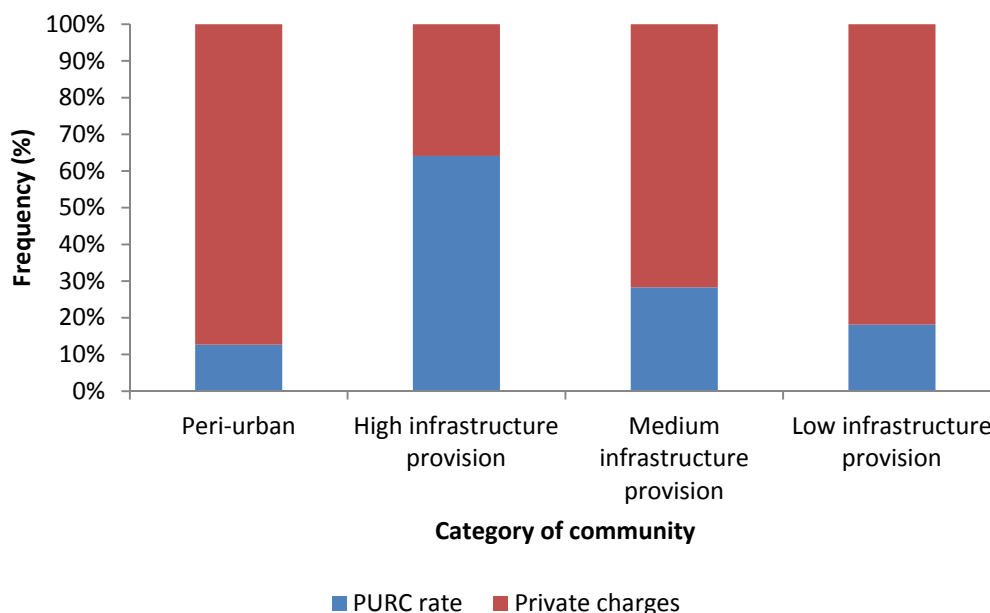
In the communities with medium infrastructure provision, there were often particulates in the water (Figure 4.5) and though the health implication of this has not been ascertained, some people do not drink the affected water for fear of a reaction to a possible contamination. However, in general, water is considered to be of safe quality for other domestic activities. In the communities with low infrastructure provision, the water quality is similarly of safe quality for various domestic and occupational activities, however, occasionally particulates are equally found in the water.

Both women and children are involved in the role of searching, fetching, and storing of water in these communities (further details on this are provided under domestic use of water below; section 4.2.1).

4.1.4 Costs of Water and Disputes over Water Bills

In the communities, households that access water from a neighbour's connection or other sources often pay far more than those with their own in-house tap water connection. Households with their own connection or having a connection in their houses usually pay the rates for water approved by the Public Utilities Regulatory Commission (PURC), while those accessing water from neighbours in general pay private charges which can be up to ten times higher or more, compared to the PURC rate. Figure 4.6 shows the frequency of households which pay either the PURC rate or private charges for water supply in the four categories of communities.

Figure 4.6: Rate or private charges paid for water by households



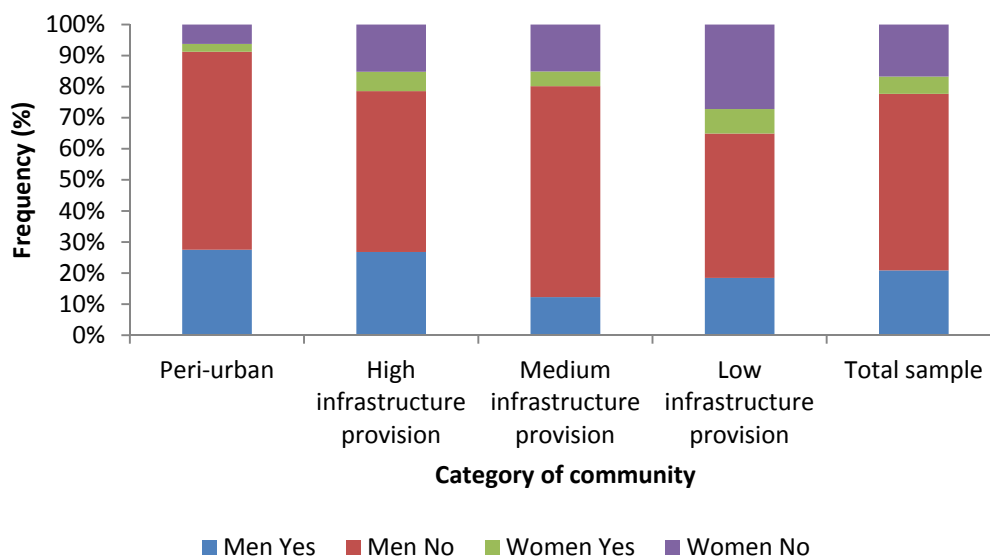
[Table placed in Appendix 4.6]

The communities with high infrastructure provision have a higher percentage (64.1%) of households paying the PURC rate for water whereas the majority of households in the peri-urban (87.3%), medium (71.7%) and low (81.9%) infrastructure provision communities accessed water at private charges. These frequencies are explained by the relatively low (23.2%) connectivity in peri-urban communities; high (76.2%) connectivity in high infrastructure provision communities, and up to half (50 %) of connectivity in medium and low infrastructure provision communities [see Table 4.1].

Some households have complaints about the cost of water in the city (Figure 4.7), including some of the households which pay the PURC rate for water. For households

living in shared compounds, although there is tap water connection, they are sometimes compelled to pay as they fetch water, in order to avoid any disagreements over sharing of water bills. In many instances such water sources are open to others from the community to buy water [personal discussions and observations in the field].

Figure 4.7: Complaints about the cost of water



[Cross tabulation in Appendix 4.7]

Within each category of community, the differences between those who had complaints on cost of water and those who did not were statistically significant (χ^2 , 3df=7.9, $p=0.048$). A low percentage (30%) of households in peri-urban and high (33%), medium (17%) and low (26.3%) infrastructure provision communities had complained about the cost of water. The cost of water is an issue across communities of different infrastructure provision. The cost of the water was perceived by some households to be high in the communities of Abelemkpe, Kokomlemle and Dzorwulu (high infrastructure provision); and also Nima, Alajo (medium infrastructure provision) with some households expressing the lacking clarity over the billing system during the focus group discussions.

Over 40% of respondents (households) in Kokomlemle (see Appendix 4.8) indicated that they reside in shared compounds with other households. This often leads to disputes over the water bills submitted to the occupants of houses and complaints are sometimes presented to the Ghana Water Company Limited / Aqua Vitens Rand Limited (GWCL / AVRL) offices for explanations. This has created a problem in some shared houses

comprising rented rooms (Appendix 4.8) where disputes over the sharing of water bills have compelled some landlords to restrict the use of in-house tap water connection to their own households, while tenants have to look for water outside.

This is a case in which the GWCL/AVRL will need to strengthen its education and awareness creation schemes to explain the billing process to the public. The mass media should be coupled with community engagements to present this explanation. It should also be possible for aggrieved persons to equally consult with representatives of the customer care offices to seek for clarification on their water bills.

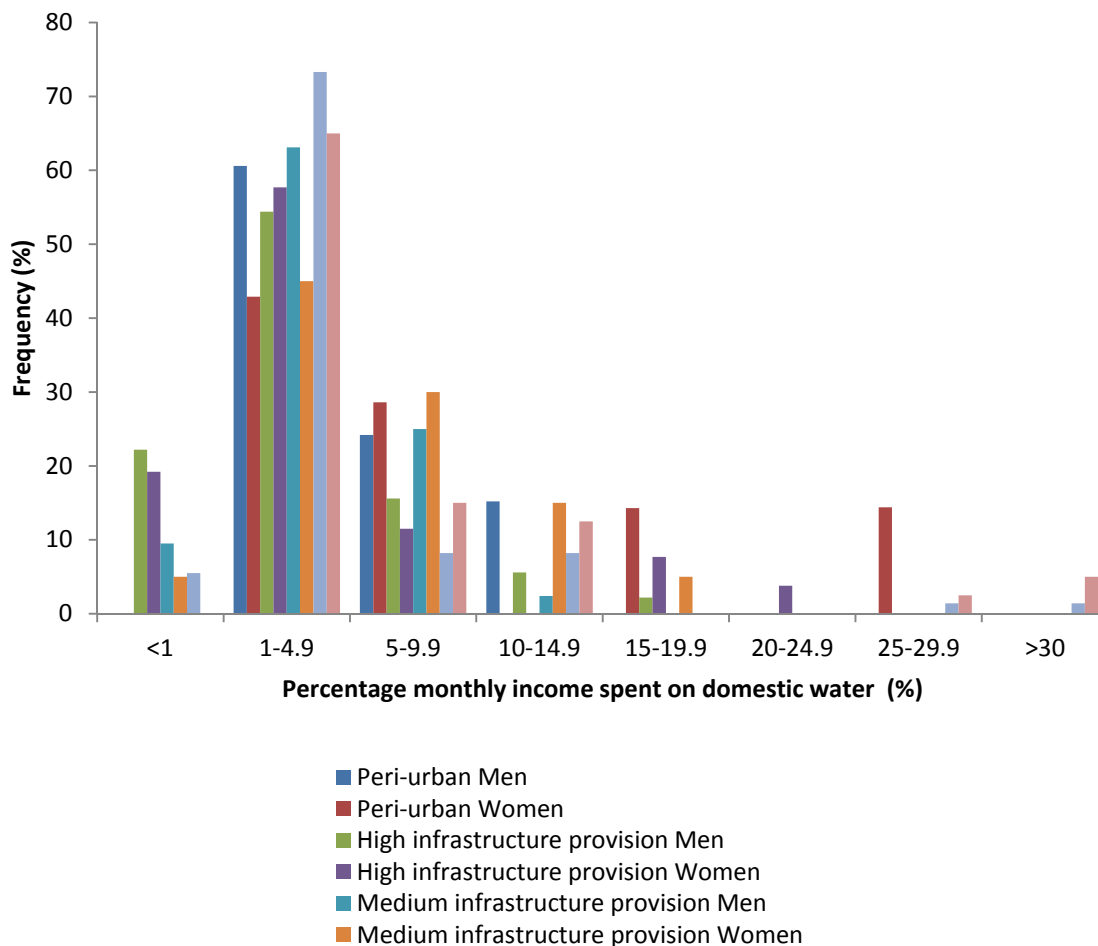
The relatively low frequency of complaints on cost of water (Figure 4.7) (Appendix 4.7) in the communities with medium infrastructure provision is explained by some factors. The people of Nima indicated that their first priority and most important need are to have a regular supply of water. Their water supply system has undergone some improvements recently. Secondly in Nima and other places where the majority of the people access water at private charges, perhaps the 'pay as you fetch' system does not let people calculate the actual amount that is being spent on water over a specific period.

Figure 4.8 shows the percentage monthly household income spent on domestic water while Figure 4.9 presents the actual mean monthly expenditure on water supplied at the PURC rate and private charges respectively in the study communities. Figure 4.8 shows that few households (9.4%) spent less than 1% of monthly income on domestic water. The higher frequency of such households in the high infrastructure provision communities [Abelemkpe, Dzorwulu and Kokomlemle] is because of access to water at the PURC rate and the overall higher levels of income (section: 4.2.2.3; Figure 4.19). In contrast, many households (61.6%) spent between 1% and 4.9% of their monthly income on domestic water.

This implies that those earning more are likely to see little impact from expenditure on water on their monthly income. Since communities in the medium and low infrastructure communities earn (see Section 4.2.2.3; Figure 4.19) less on the average than the communities with high infrastructure provision (except Kokomlemle), expenditure on water will have a higher impact on their monthly income. Some households (18.2%) spent between 5% and 9.9% of their monthly income on domestic

water, with only a few households (10.8%) spending beyond 10% of their monthly income on domestic water.

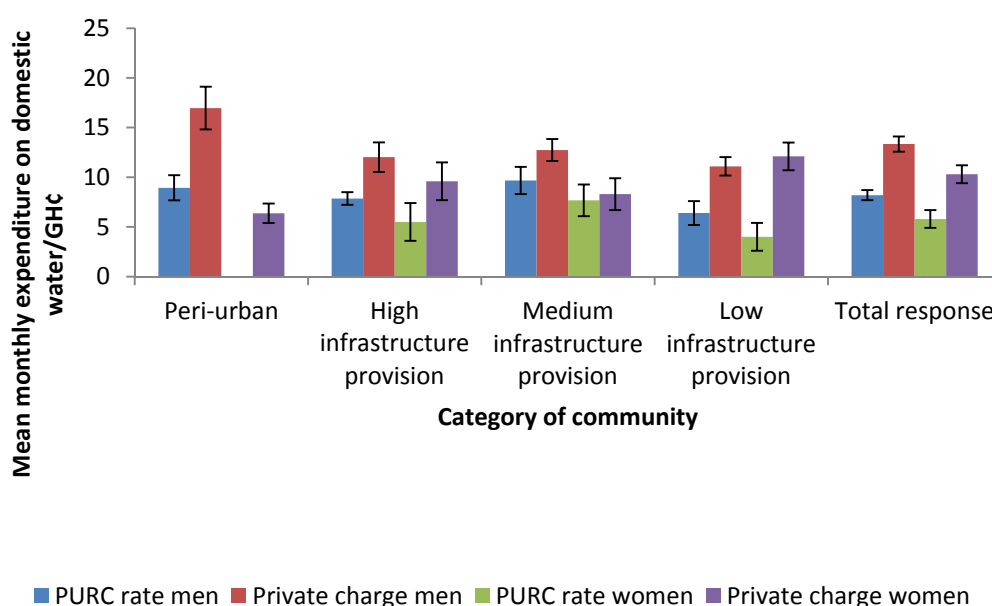
Figure 4.8: Percentage monthly household income spent on domestic water by gender of household heads



[Table placed in Appendix 4.9]

Although the amount of money spent on water depends on user behaviour and household size, Figure 4.9 shows that, in general, those who access water at private charges spend more (but for less water) than those accessing (more) water at the PURC rate.

Figure 4.9: Mean monthly expenditure on domestic water for households obtaining water at the PURC rate and private charges



[1USD =GH¢ 1.48 in January 2011] [Table placed in Appendix 4.10]

In all four categories of communities, there were no significant differences in the mean monthly expenditure on domestic water by male and female headed households accessing water at either the PURC rate ($P>0.05$) or private charges ($P>0.05$) (Appendix 4.11) (For expenditure at individual community level, see Appendix 4.12).

4.2 WATER USE

4.2.1. Domestic Use of Water

4.2.1.1 Comparison of water use at PURC rates and private charges

The amount of water used by households in the various communities was examined. Access to water is of two types: either at the PURC rate or private charges as indicated above. In terms of per capita per day use of water (in litres; at PURC rate and private charge combined) in the communities, households in Agbogba (79.43 ± 13); Abelemkpe (132 ± 14.5); Dzorwulu (137 ± 12.2); Kokomlemle (67 ± 11.3); and Nima (69.94 ± 9.8) used relatively more water than Abokobi-Pantang (36 ± 4.7); Alajo (57.7 ± 9.6); Abofu (56.6 ± 6.1); North Industrial Area (31.84 ± 4.3); and Sabon Zongo (39.34 ± 5.9).

This means that households in the high infrastructure provision communities are more likely to use more water than those in the medium infrastructure provision communities

which are also likely to use more water than those in the low infrastructure provision communities. Water use in the overall sample was 71.3 litres per capita per day. There were no reports of households combining water use at the PURC rate with private charges though households had to access water from private sources when the tap water stops flowing.

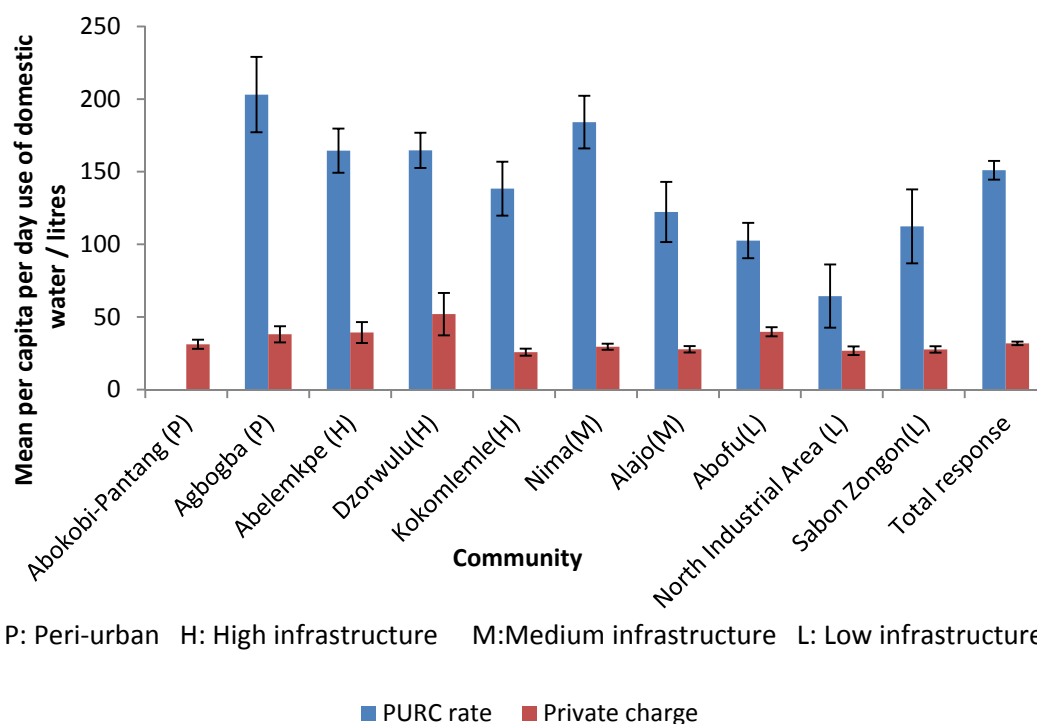
Mean per capita per day use of water at the PURC rate (Figure 4.10) was significantly higher than that at the private rate in all cases ($P < 0.05$) except North Industrial Area, ($P > 0.05$) (Appendix 4.13). This supports the fact that households with access to water at the PURC rate tend to use more water than those buying at private charges.

The maximum mean per capita per day use of water accessed at the PURC rate was recorded at Agbogba, 203.09 ± 25.98 litres ($n=8$) followed by Nima, 184.15 ± 18.14 litres ($n=17$) and the three communities with high infrastructure provision, Abelemkpe, 164.5 ± 15.24 litres ($n=29$), Dzorwulu, and 164.72 ± 12.12 litres ($n=29$), Kokomlemle, 138.32 ± 18.55 litres ($n=14$). It must be noted that the above estimated per capita consumption of water are for domestic use only (water use for commercial activities are estimated separately). These estimates are based on the information received from respondents. The relatively high PURC rate obtained for some of the communities may probably be due to the low sample realised for PURC water use.

The lowest recorded mean per capita per day consumption at PURC rate was at North Industrial Area, 64.37 ± 21.76 litres. In the case of water use at private charges, the maximum was observed in Dzorwulu, 51.93 ± 14.62 .

Details on significant differences in water use at the PURC rate and private charges in the different communities are presented in Appendix 4.14.

Figure 4.10: Mean per capita per day domestic use of water in communities at PURC rate and private charges



[Table of means is in Appendix 4.13].

The high variation in domestic water use at PURC rate and private charges is explained by differences in user behaviour and household factors such as specific cases of misuse of water, or hidden use of water for some activities as well as differences in household sizes. Mean per capita per day use of water ranged from 64-203 litres for households accessing water at the PURC rate and 26-52 litres for households accessing water at private charges. Therefore interventions should also factor in the promotion of wise use of water especially among households accessing water at the PURC rate. Figure 4.11 illustrates differences in water use in relation to gender of household head [Appendix 4.15].

4.2.1.2 Comparison of water use by gender in the communities

Figure 4.11 and Table 4.3 show that female headed households used significantly ($P < 0.05$) more water per capita per day than the male headed households in the low infrastructure communities.

In all four categories of communities, both male and female headed households accessing water at the PURC rate, used significantly more water than those accessing

water at private charges ($P < 0.05$) (Appendix 4.16) (water use at PURC explained above).

Figure 4.11: Use of domestic water in the different categories of communities by gender of household head

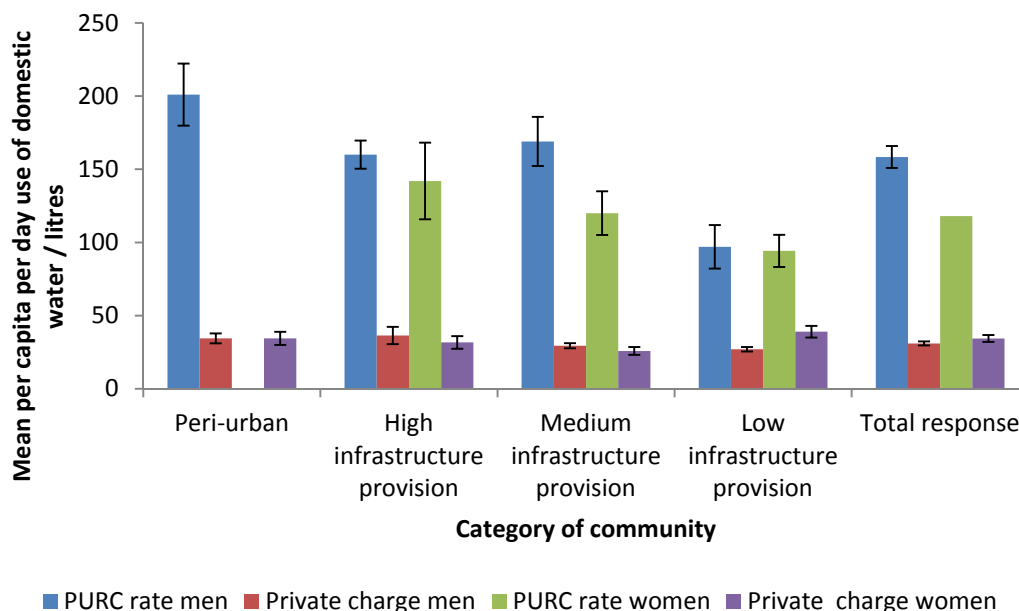


Table 4.3: Comparison of male and female headed households' per capita per day use of domestic water

Category of community	Sig. for use at PURC rate [p-value]P*	Sig. for use at private charges [p-value]*
Peri-urban	-	0.997
High infrastructure provision	0.383	0.569
High infrastructure provision	0.162	0.388
Low infrastructure provision	0.9	0.001

*See Appendix 4.15 for further details

A comparison of mean per capita per day use of domestic water at the PURC rate by **male headed** households in different categories of communities (Figure 4.11) shows that their water use in peri-urban, high and medium infrastructure provision communities was significantly higher than water use in communities with low infrastructure provision ($P < 0.05$) (Appendix 4.17). Water use at the PURC rate in male headed households at the medium infrastructure provision communities was a little higher than the male headed households in the high infrastructure provision communities, but not significant ($P > 0.05$) (Appendix 4.17).

The evidence from the study indicates that in communities with low infrastructure provision, water use is in general low for male headed households accessing water at the PURC rate compared with the other three categories of communities. One possible reason could be that households are avoiding paying the high cost of bills. Since male headed households in the low infrastructure communities had the largest household size (4.7 ± 0.23), it would have been expected that per capita per day use of water accessed at the PURC rate would also have been high.

In male headed households, accessing water at private charges, per capita per day use of domestic water in peri-urban and high infrastructure provision communities was significantly higher than in communities with low infrastructure provision ($P < 0.05$) (Appendix 4.17).

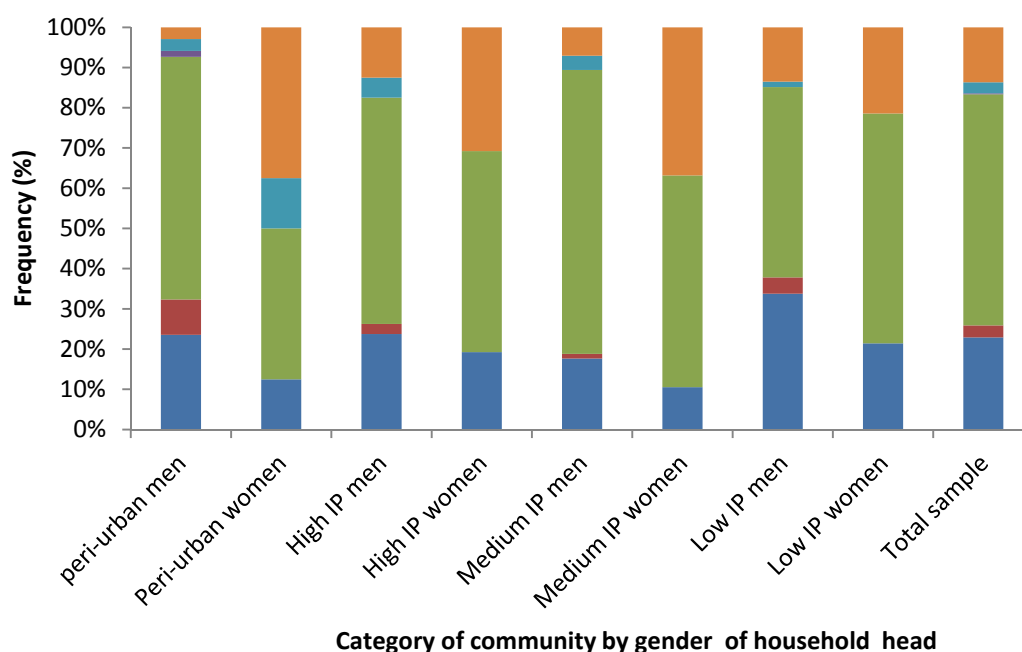
Per capita per day use (39 ± 4 litres) of domestic water by **female headed** households accessing water at private charges in communities with low infrastructure provision was significantly higher than in communities with medium infrastructure provision (25.85 ± 2.6 litres) ($P < 0.05$) (Appendix 4.17). This could be attributed to possible user behaviour in the community since female headed households in the communities with medium infrastructure provision have a larger household size (4.18 ± 0.49) than the communities with low infrastructure provision (3.87 ± 0.3) (section 4.2.2.3: Table 4.4).

In the overall sample, mean per capita per day use of domestic water by households accessing water at the PURC rate was 150 ± 6.5 litres (response=134) and at private charges was 31.81 ± 1.21 litres (response=276) (Appendix 4.16). According to unpublished data presented by the Ghana Water Company Limited for 2006, urban water consumption ranged from 30-120 litres per capita per day, depending on whether water is obtained at private charges or PURC rate (Abraham *et al.*, 2007). This calls for measures to enhance access to water by people obtaining water at private charges and also to introduce measures that could discourage wastage of water in households accessing water at the PURC rate. Most households accessing water at private charges did not own a flush toilet and that explains why such low per capita per day use was observed (Appendix 4.18).

4.2.1.3 Fetching water

The unscheduled closure of tap water supply in the city implies that households always have to store water (as mentioned above) so that in the event of a closure of the water supply they would have some water to use, whether connected or not. In the case of those without a connection, fetching water for the household is a regular activity. Figure 4.12 shows that it is usually the women and the children or other (external individuals who may be asked by households to fetch water as they receive payment for their services) people who perform this role.

Figure 4.12: Responsibility for fetching water in male and female headed households



IP: Infrastructure provision

■ Mother ■ Father ■ Children ■ Househelp ■ > one group ■ Other

[Table placed in Appendix 4.19]

In the peri-urban and urban context, the men do not concern themselves much with water availability within the household except in an emergency and during late pregnancy of the woman of the household.

‘Women still fetch water, clean, and cook. I cannot carry water, so my children do the fetching - unless they are not available and there is no water -before you see me fetching water’ (women’s focus group, Abokobi-Pantang).

‘Women usually fetch water, clean, cook, and bath children’ (women’s focus group, Dzorwulu).

“I send the children to fetch water in this situation or employ the services of other people. Women must do the cleaning and other activities, unless you have no wife” (men’s focus group, Kokomlemle).

‘Fetching water, washing, cleaning, cooking, bathing of children are all carried out by women, except when they are not available’ (women’s group, Alajo).

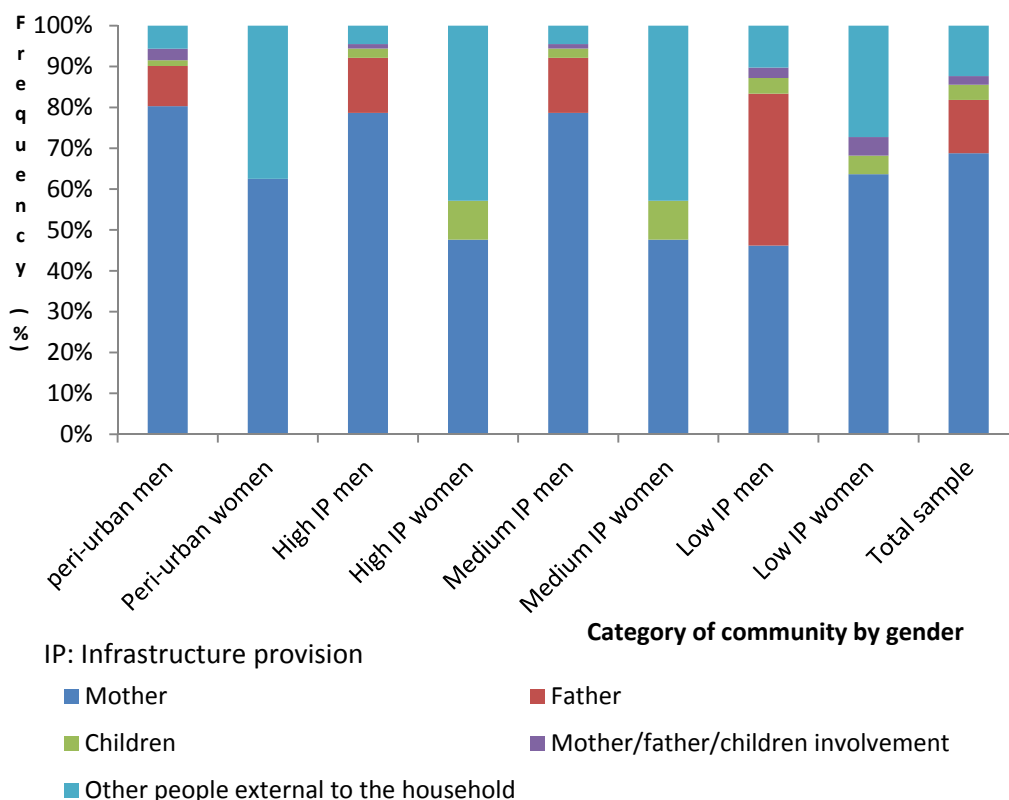
‘Women perform the role of cleaning and fetching water’ (mixed focus group, Abofu). ‘I store water so that when the taps are not flowing I can use it. The children are also involved in fetching water when the taps are not flowing’. ‘I do not involve my children, I go to fetch the water myself in spite of my age [over 50 years] because sometimes the taps start flowing at 2 am and at that time you cannot ask any child to go and fetch water’ (women’s focus group, Abofu).

Children support their parents in their roles as domestic water ‘managers’. In the course of searching for water outside the house, children may be affected negatively. In some instances in Nima and elsewhere, children searching for water may be injured or fail to go to school because of lack of water. This is represented in the statements from both the women’s and men’s focus groups in Nima:

‘We are suffering’. ‘If the water does not flow it gives a lot of stressful times’ (women). ‘When the water is not flowing some of the community members move to places as far as 2-3km away in search of water. ‘This affects the schooling of children since they are late to school sometimes’ (men).

However, when it comes to the payment for water, the involvement of men changes (Figure 4.13; Appendix 4.20). A limited percentage of men take responsibility for paying for water in male headed households in the peri-urban (9.9 %), high (8.9 %), medium (13.5 %), and low (37.2 %) infrastructure provision communities respectively. The percentage of men paying for water is a little higher in the communities with low infrastructure provision. Male headed households have slightly more small children (Appendix 4.21) and larger household sizes (Table 4.4) and therefore will require more water for their domestic activities (except in situations where deliberate efforts are made to control the use of water under the PURC rate –Figure 4.11). The evidence in Figure 4.13 still indicates a shared role by women and their older children [either employed or engaged in some income generating activities] to pay for water in both male and female headed households. People external to the households and are involved in payment of water are usually extended family members. This is more important in female headed households than in male headed households.

Figure 4.13: Responsibility for paying for water by gender of household head



[Table placed in Appendix 4.20].

The cost of water may sometimes increase (Appendix 4.22) (over 40% in most cases answered yes except in Nima) when water is fetched from outside the community, especially during unscheduled periods of water supply stoppages, and households have exhausted their stored water. Water rationing, a common practice in Accra, can exclude households who often lack the capacity to store water or afford the high prices of water sold at alternative water selling points. Therefore in order to avoid spending too much on water during water supply cuts, households are expanding their storage capacities and therefore fetching water quickly from the pipe network with its attendant effect on pressure levels in the pipelines.

4.2.2 Water Use and Income [Financial Assets]

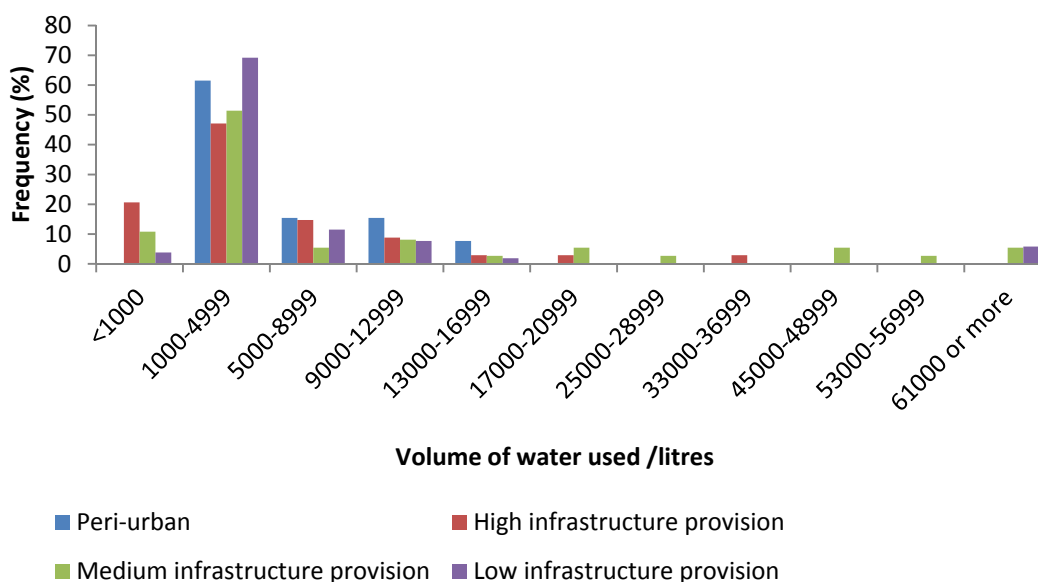
This section presents the factors influencing water dependent occupations in the communities. It discusses the amount of water used for occupations, household sizes, types of water dependent occupations, and the contributions water dependent occupations make to total household income.

4.2.2.1 Water use for occupations

Households involved in water dependent occupations either used water for some activity or traded in sachet water [a small scale industrial product]. Figure 4.14 shows the amount of water used for some income generating activities by households (only households which accessed and used water for some activity). It indicates three important water use ranges: 1000-8,999 litres/month (69.1% (94); 9000-16,999 litres/month (11.7 % (16); and beyond 16, 999 litres/month (19.2% (13).

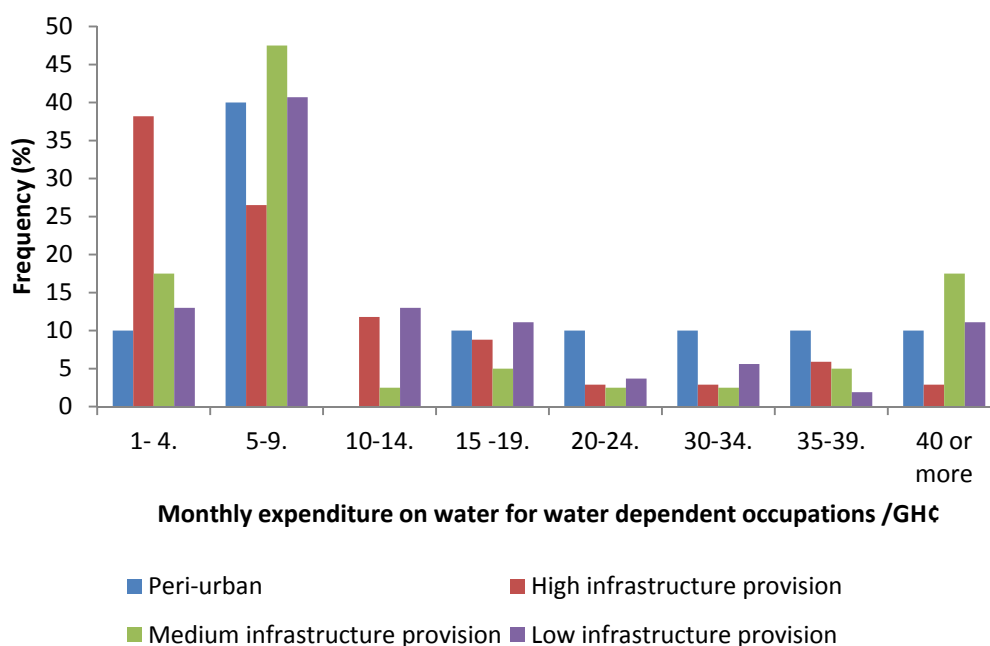
Figure 4.14 shows that making available small quantities of water per month will allow water dependent occupations to be practiced by households. Water supply managers need to consider this in their efforts to improve access to water. These low quantities of water may cost the users up to about 9 Ghana cedis (\$ 6) per month for the majority and up to 20 Ghana cedis (\$ 13.5) and beyond in some cases (Figure 4.15). The relatively low expenditure on water in the high infrastructure communities is explained by the slightly higher percentage (34.5%) (Appendix 4.25) of households which accessed water at the PURC rate for income generating activities than in the other categories of communities.

Figure 4.14: Monthly volume of water used by households in water dependent occupations



[Table placed in Appendix 4.23] [Total response at this stage excludes households which traded in sachet water, which is already bagged by the producers].

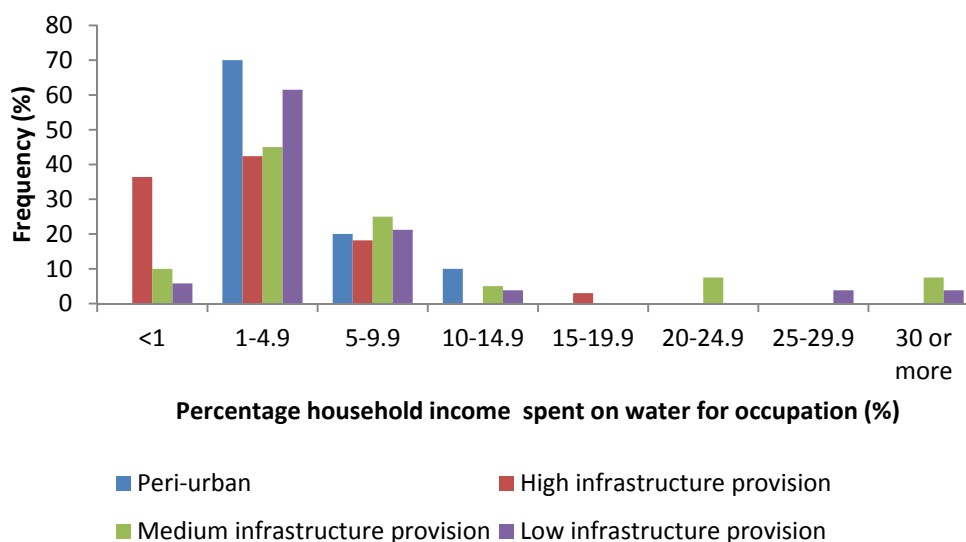
Figure 4.15: Monthly expenditure on water for water dependent occupations by households



[Table placed in Appendix 4.24] [Total response at this stage excludes households which traded in sachet water, which is already bagged by the producers]

The monthly expenditure on water shows that the majority of water users spent up to 10% of their net monthly income on water for occupations (Figure 4.16).

Figure 4.16: Percentage household income spent on water for occupation

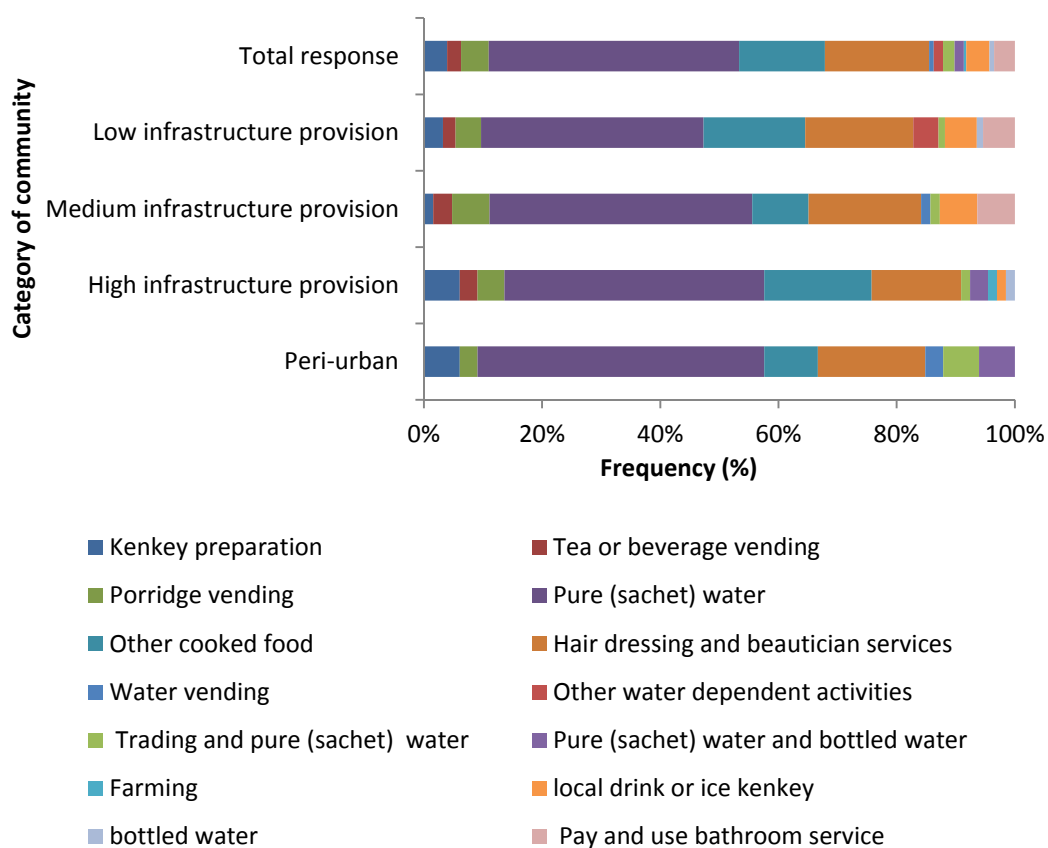


[Table placed in Appendix 4.26] [Total responses at this stage excludes households which traded in sachet water, which is already bagged by the producers]

4.2.2.2 Types of water dependent occupation

Figure 4.17 shows the frequencies of the different types of water dependent occupations engaged in by households, while Box 4.1 briefly defines the nature of these water dependent occupations. The major water dependent occupations are porridge vending, tea or beverage vending, *kenkey* preparation and sale, pure water (sachet water) sale, other cooked food sale, hair dressing and beautician services and ‘pay and use’ bathroom services. It should also be noted that bathroom operations are only common in communities with medium and low infrastructure provision where there is demand for these services because some houses lack bathrooms. These bathrooms are usually built in the private owners’ compound.

Figure 4.17: Type of water dependent occupations engaged in by households by category of community



[Table placed in Appendix 4.27]

Box 4.1: Description of Water Dependent Occupations

Kenkey preparation: A preparation from fermented corn dough which is wrapped in corn husks and boiled for several hours. It is sold together with fish/stew/ground tomato and pepper.

Porridge vending: Usually porridge prepared from ground millet and served with milk, sugar, groundnut, and bread as well as other fried preparations of beans, doughnut or bread.

Tea or beverage vending: A preparation of various kinds of beverage and tea, sold together with fried eggs and bread.

Pure water (sachet water): Also known as sachet water, pre-bagged 500 ml each sold in packs of 30 or ***individual*** sachets. There are sachet water producers, either on large scale or small scale and then retailers continue with the supply chain.

Trading and pure water: A combination of mainly groceries with the sale of sachet water

Other cooked food: This includes rice, tubers, maize preparations, among others which are served with fish, stew, soup and other preparations.

Hair dressing and beautician services: various types of salons for women offering services of hair and skin care.

Water vending: This involves the small-scale sale of treated water

Pure water and bottled water: Combined sale of sachet and bottled water

Farming: Usually crop cultivation

Local drink preparation or ice kenkey: These are various kinds of non-alcoholic drinks prepared from a variety of products, including kenkey.

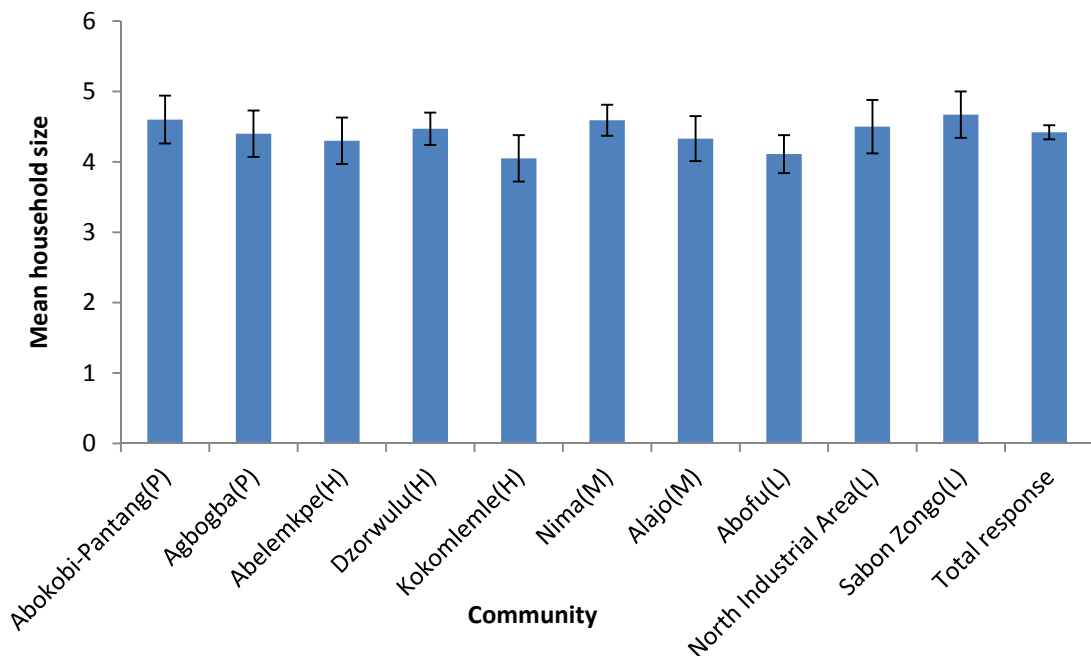
Bottled water: Sale of only industrial bottled water of various volumes

Bathroom operation: Operators offer bathroom services to clients who may usually come from within or outside of the community.

4.2.2.3 Household size, household income and contributions from water dependent occupations

The mean household size of the communities ranged from 4.05 ± 0.33 in Kokomlemle to 4.67 ± 0.33 in Sabon Zongo (Figure 4.18) (Table in Appendix 4.28). There was no statistically significant difference between the mean household sizes of the selected communities ($P > 0.05$) (Appendix 4.29). Figure 4.18 nonetheless shows that in Accra, the household sizes in the communities with medium and low infrastructure provision are likely to be larger than in the communities with high infrastructure provision where there is a concentration of high earning households. Household sizes are important for per capita water use and household income calculations.

Figure 4.18: Mean household size in communities



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure

[Table in Appendix 4.28].

Male headed households were significantly larger than the female headed households in the communities with high and low infrastructure provision ($P < 0.05$) (Appendix 4.30). The overall mean household size in the sample agrees with the statement above that, in Accra, household sizes of communities with medium and low infrastructure provision are likely to be larger than communities with high infrastructure provision, though not significant ($P < 0.05$) (Appendix 4.30). Furthermore, in the total response for all the ten communities [that is the sample as a whole] in the survey, male headed households were significantly larger than female headed households (Table 4.4) (Appendix 4.30).

Table 4.4: Mean sizes of male and female headed households by category of communities

Category of community	Gender of household head	Mean household size	SD	SE
Peri-urban	Man [74]	4.66	2.01	0.234
	Woman [8]	3.13	2.9	1.03
	Total [82]	4.5	2.14	0.24
High infrastructure provision	Man [92]	4.52	1.75	0.18
	Woman [28]	3.54	2.32	0.44
	Total [122]	4.3	1.93	0.17
Medium infrastructure provision	Man [90]	4.57	1.87	0.2
	Woman [22]	4.18	2.28	0.49
	Total [112]	4.5	1.95	0.18
Low infrastructure provision	Man [81]	4.7	2.13	0.24
	Woman [46]	3.87	2.1	0.30
	Total [127]	4.42	2.13	0.19
Total sample	Man [339]	4.62	1.93	0.1
	Woman [104]	3.79	2.23	0.22
	Total [443]	4.42	2.03	0.1

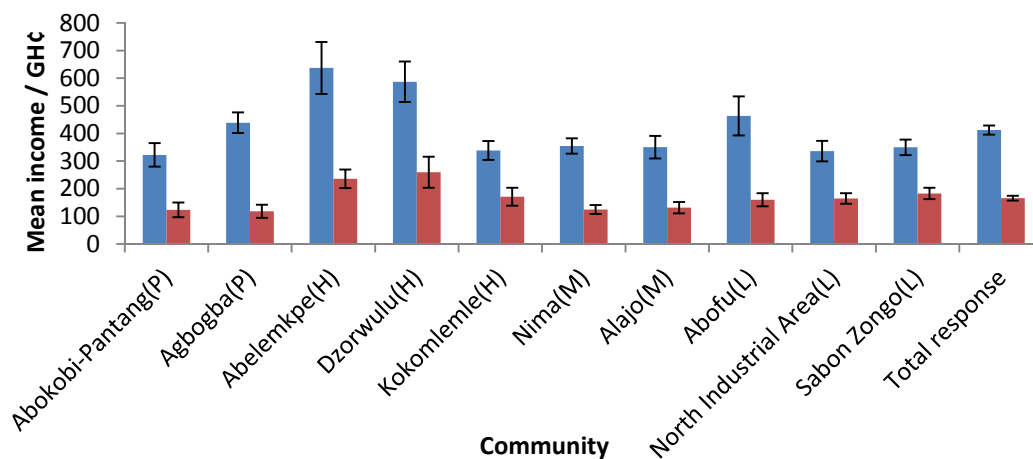
An estimate from the 2000 population and housing census indicates an average household size of 4.5 for Accra (Ghana Statistical Service, 2002).

In the peri-urban communities, the mean monthly household income (Figure 4.19) ranged from GH¢ 322.5 ± 42.68 (\$ 218 ± 28.84) in Abokobi-Pantang to GH¢ 637 ± 94.21(\$ 430.41 ± 63. 66) in Abelemkpe. Furthermore, the mean monthly household income at Abelemkpe was significantly higher (P<0.05) (Appendix 4.29) than all communities except Dzorwulu (GH¢ 587 ±73) (\$ 396.92 ± 49.32).

The mean monthly household income at Dzorwulu was significantly higher (P<0.05) (Appendix 4.29) than all communities except Abofu (463.64 ±70.5) (\$ 313.3 ± 47.64) and Abelemkpe. Abelemkpe, Dzorwulu, and Kokomlemle, as communities with high infrastructure provision, could be expected also to have high income levels. The case is true for Abelemkpe and Dzorwulu where there are many rich people, however, the mean monthly income of Kokomlemle (GH¢ 338.38 ± 34) (\$ 228. 64 ± 23), is

comparable with the value for communities with medium and low infrastructure provision.

Figure 4.19: Mean total monthly household income and net income from water dependent occupation



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure
 ■ Mean total household income
 ■ Mean total income from water dependent occupation

[Table in Appendix 4.28] [Thus 59.14 % of households were involved in water dependent occupation][1 USD = GH¢ 1.48]

The almost similar mean monthly income in Nima (GH¢ 354.64 ± 27.81) (\$239.62 ± 18.8), Alajo (352.43 ± 40.7) (\$ 238 .13 ± 27.5) (all of medium infrastructure provision) and Sabon Zongo (GH¢ 349.97) (\$ 236.5) (low infrastructure provision) are attributed to the fact that these are relatively larger communities, with a higher number of households. They host many commercial activities (thus have relatively more income generating opportunities than North Industrial Area and Abokobi-Pantang). In the urban areas, North Industrial Area recorded the lowest mean monthly household income (GH¢ 336.32 ± 28.06) (US\$ 227. 24 ± 18.96) because of lack of opportunities as compared to Nima, Alajo, and Sabon Zongo [from personal observation in the field and discussions with the community].

Contrary to expectation, the mean monthly income of households in Abofu (GH¢ 463.64 ± 70.5) (\$ 313.27 ± 47.64), was higher than that of Kokomlemle. However, the standard deviation (GH¢ 462.1) (\$ 312.23) (Appendix 4.29) of the mean indicates a higher variation in the household incomes at Abofu, indicating that some of the high earning households skewed the income to the current mean level. Household incomes

are highly variable within communities in the city because apart from specific places where the rich are in the majority, in many cases the rich and the poor are interspersed in the population. Therefore the use of the mean income may conceal important variation. In order to respond to that, assessment of household income as an index of socio-economic status should be coupled with other approaches in order to make informed decisions (see section 4.4.3: Principal Component Analysis).

The mean monthly income of male headed households was significantly higher than the female headed households in all four categories of communities ($P < 0.05$) (Appendix 4.30) (Table 4.5).

Table 4.5: Mean monthly household income of male and female headed households

Category of community	Gender of household head	Mean total monthly household income GH¢ [USD in brackets]	SD	SE
Peri-urban [N=82]	Man [73]	407.41(275.27)	258.5	30.25
	Woman [8]	158.75 (107.3)	129.9	1.02
	Total [81]	382.85 (273.5)	259.94	28.77
High infrastructure provision [N=122]	Man [94]	558.37 (377.3)	493.95	50.94
	Woman [27]	361.18 (244)	242.86	46.74
	Total [121]	514.00 (347.3)	456.8	41.52
Medium infrastructure provision [N=112]	Man [89]	395.75 (267.4)	247.18	26.2
	Woman [22]	180.50 (122)	112.01	28.88
	Total [111]	353.04 (238.5)	242.3	23
Low infrastructure provision [N=127]	Man [79]	445.94 (301.3)	371.95	41.85
	Woman [44]	276.66 (192 .1)	160.52	24.2
	Total [123]	385.38 (260.4)	322.76	29.1
Total sample [N=443]	Man [335]	455.70 (308)	367.7	20.1
	Woman [101]	268.90 (182.7)	187.45	18.65
	Total [436]	412.50 (278.7)	343.7	16.5

The total figures show the income for each category-with men and women combined

However, mean monthly household income of male headed households in all four categories of communities tends to correspond with larger household sizes (Table 4.4, 4.5) and therefore a larger number of mean earners per house (section 4.4.4.1 to 4.4.4.2; Figure 4.43). In order to understand the household income distributions, the mean of the

per capita monthly household income was computed for each community (Table 4.6). Per capita monthly household income is determined by dividing monthly household income by household size. This helps to understand how much is (potentially) available for each member of the household.

Table 4.6: Per capita monthly household income

Location of Respondent [N]	Mean per capita income GH¢ (USD in brackets)	Std. Deviation	Std. Error of Mean
Abokobi/Pantang [40]	74.914 (50.7)	63.05	10.00
Agbogba [42]	116.99 (79)	69.53	10.73
Abelemkpe [39]	108.26 (73)	78.59	12.58
Dzorwulu [40]	160.88 (109)	138.61	21.92
Kokomlemle [43]	136.27 (92)	87.48	13.34
Nima [70]	86.7 (58.6)	59.979	7.17
Alajo [42]	102.30 (69)	90.77	14.01
Abofu [44]	83.13 (56)	54.05	8.15
North Industrial Area/Avenor [40]	90.10 (61)	70.52	11.15
Sabon Zongo [43]	79.50 (54)	46.80	7.14
Total sample [443]	102.64 (69.4)	81.63	3.88

Table 4.6 reveals that in Accra, the communities with high infrastructure provision also had high mean per capita monthly household income. The communities with medium infrastructure provision showed an exception, with Nima (86.69 ± 7.2) being slightly lower than North Industrial Area (90.09 ± 11.15). Nima had slightly larger mean household size (4.59) than North Industrial Area (4.5). The other communities with low infrastructure provision (Abofu and Sabon Zongo) had low values as expected (for significant differences between the mean per capita household incomes see Appendix 4.31).

The income distribution (Figure 4.19) shows that Abelemkpe, Dzorwulu, and Abofu were ahead of Agbogba, Nima, Alajo, and Sabon Zongo, which were also ahead of Kokomlemle, North Industrial Area and Abokobi-Pantang.

However, mean per capita monthly income shows that Dzorwulu, Kokomlemlle, Agbogba, and Abelemkpe were better off than Alajo, North Industrial Area, and Nima which were also better off than Abofu, Sabon Zongo, and Abokobi-Pantang.

The notable differences are that whereas the income distribution shows that Abofu (which is a low infrastructure provision community) has income comparable to some communities in the high infrastructure provision communities, the per capita income indicates that its rather comparable to those with the low income (such as Sabon Zongo). The mean per capita monthly income also shows that Sabon Zongo is worse off than the income indicates and Kokomlemlle is rather better off in terms of the per capita monthly income than the monthly income shows.

Table 4.7: Per capita monthly income by gender of household head.

Income group [N]	Gender of HH head	Mean (GH¢) (USD in brackets)	Response	Std. Deviation	Std. Error of Mean
Peri-urban [82]	Man	98.4 (66.6)	74	69.06917	8.02913
	Woman	78.7 (56.2)	8	74.15224	26.21678
	Total	96.5 (65.2)	82	69.34698	7.65809
High infrastructure provision [122]	Man	136.11(92)	94	106.92140	11.02810
	Woman	132.95(90)	28	104.84672	19.81417
	Total	135.4 (91.5)	122	106.02568	9.59911
Medium infrastructure provision [112]	Man	92.0 (62)	90	73.88393	7.78805
	Woman	94.99(64)	22	71.17806	15.17521
	Total	92.6 (62.6)	112	73.05387	6.90294
Low infrastructure provision [127]	Man	84.3 (57)	81	59.06888	6.56321
	Woman	83.6 (58)	46	54.72657	8.06899
	Total	84.1 (57)	127	57.31555	5.08593

The male headed households in general had a higher mean per capita monthly household income than the female headed households in three of the categories of communities, while that of female headed households was slightly above the male headed households in the communities with medium infrastructure provision (Table 4.7). However, the differences between male and female headed households were not significant ($P < 0.05$) (Appendix 4.32).

The mean per capita monthly household income of the high infrastructure provision communities was significantly higher than all three remaining categories of communities ($P < 0.05$) (Appendix 4.32). Table 4.7 shows that, the mean per capita monthly household income values ranged from the lowest to the highest in order of low infrastructure provision, medium infrastructure provision, peri-urban and high infrastructure provision communities.

According to the Local Government Bulletin (2002), AMA indicated that per capita monthly income (calculated from the annual figure provided) in high infrastructure provision communities could range from \$73.6 to \$126.65 (using exchange rate of GH¢1.48 to \$1; this is the equivalent of GH¢109 to GH¢187.4). For medium and low infrastructure communities, it could be \$34 to \$66 (GH¢50.3 to GH¢ 98). These compare with the per capita household incomes in Table 4.6.

Water dependent occupations and corresponding income

Contributions to household income come from various sources. One such source is water dependent occupations (Figure 4.17; Box 1; Figure 4.19) where 59.14% (262) of households were involved. The mean net monthly household income contribution from a water dependent occupation was GH¢ 118.4 \pm 23.6 (\$ 80 \pm 15.95) at Agbogba and GH¢ 259.5 \pm 56.13 (\$175.34 \pm 38) in Dzorwulu [mean values are only for households involved in water dependent occupations].

The mean income from water dependent occupations show that households in Dzorwulu, Abelemkpe, Sabon Zongo, and Kokomlemle were higher than North Industrial Area, Abofu, and Alajo, which were also higher than Nima, Abokobi-Pantang and Agbogba. Abelemkpe and Dzorwulu were significantly higher than all others except North Industrial Area, Kokomlemle (both only in the case of Abelemkpe), and Sabon Zongo, but not significantly different from each other (Appendix 4.29).

Although income from the water dependent occupations of the male headed households in the high and medium infrastructure provision communities were higher than those of female headed households, this was not significant ($P > 0.05$) (Appendix 4.30).

Though the mean net monthly income from the water dependant occupation of the female headed households was slightly higher (Table 4.8) than the male headed

households in the communities with low infrastructure provision, it was not significant ($P>0.05$) (Appendix 4.30). In the total sample, the mean income from water dependent occupations of female headed households (GH¢ 166.16 ± 16.23) (\$112.27) was almost similar to the male headed households (GH¢ 165.58 ± 10.13) (\$111.88). Therefore in both peri-urban and urban communities, water dependent occupations make significant contributions to the income of both male and female headed households.

Table 4.8: Mean monthly income from water dependent occupation by gender

Category of community [N in parenthesis]	Gender of household head[response]	Mean net monthly income from water occupation. GH¢ (USD/\$ in brackets)	SD	SE
Peri-urban [N=82]	Man [31]	120.58 (81)	100.25	18
	Woman [1]	-	-	-
	Total [32]	120.4 (81.35)	98.63	17.43
High infrastructure provision [N=122]	Man [45]	233.94 (158)	192.4	28.68
	Woman [22]	184.5 (124.7)	170.04	36.3
	Total [67]	217 (146.6)	185.52	22.7
Medium infrastructure provision[N=112]	Man [48]	130.44 (88)	105.07	15.17
	Woman [16]	118.6 (80.14)	91.15	22.79
	Total [64]	127.48 (86.14)	101.2	12.65
Low infrastructure provision [N=127]	Man [64]	165.68 (112)	114.41	14.3
	Woman [35]	177.85 (120.2)	137.2	23.2
	Total [99]	169.98 (114.85)	122.4	12.3
Total sample [443]	Man [188]	165.58 (111.88)	138.86	10.13
	Woman [74]	166.16 (112.27)	139.61	16.23
	Total [262]	165.75 (112)	138.81	8.57

1 USD = GH¢ 1.48 as at January, 2011

Though water dependent occupations are practiced in both the peri-urban and the urban communities, they are more common (and also of a wider variety) in the communities with medium to low infrastructure provision. The most common water dependent activities are sachet water vending and operating a hair dressing salon, (Figure 4.17) found in all four categories of communities. In high, medium and low infrastructure communities, food vending is also important, particularly sale of cooked food in the medium and low infrastructure communities.

One of the factors which explains the differences in the incomes from water dependent occupations is the type and size of the investment as a household strategy for products with standard prices across the city (such as sachet water and bottled water). Though the percentages of households involved in sachet water vending in each category of the communities is similar (see paragraph after Table 4.11; which shows that around 40% of households from the various categories of communities invested in sachet water vending), the investments in sachet water (Appendix 4.33) are higher in the high infrastructure provision communities than the other three.

The contribution from sachet water partly accounts for differences between the high infrastructure communities and the other three categories of communities. In Abelemkpe and Dzorwulu (high infrastructure), households are able to invest more into the sale of sachet water and that corresponds with the higher returns. The high infrastructure communities have a higher mean monthly investment into water dependent occupation (GH¢ 461) (\$ 311) than in the peri-urban communities (GH¢ 172) (\$ 116.2); medium infrastructure communities (GH¢ 299) (\$202); or the low infrastructure communities (GH¢ 251) (\$169.6) (Appendix 4.33). However, there was no significant correlation between the mean monthly investments into a water occupation and the mean net monthly income from a water dependent occupation (Appendix 4.33).

This means that apart from the sale of sachet water, profits on all other water dependent occupations are determined by individual factors and local conditions which regulate transactions. Therefore the household strategy is to identify specific water dependent products that the community needs and to provide them. For instance, sachet water has a high demand because of the water challenges in the city in terms of availability and concerns over its quality. In the case of food vending, the demand relates to the fact that many households depend on cooked food outside their homes, especially in Alajo, Nima (all medium infrastructure provision), Abofu, North Industrial Area and Sabon Zongo (all low infrastructure provision).

The start-up capital for such water dependent occupations is usually low and therefore households can get involved with a small amount. For instance, to start trading in sachet water, a household could begin with just about a dollar and build the capital base as time goes on. Increase in investments will therefore happen over time with re-

investment of profits. This is because there is demand for the products of water dependent occupations.

The percentage contribution of water dependent occupations to the total monthly income of households is shown in Table 4.9. In the peri-urban communities, water dependent occupations contributed 1-20 % to the total monthly income of 50 % of households; it contributed 21-40 % of the total monthly income of 31.3 % of the households. These two ranges (1-20 % and 21-40 %) were important in the peri-urban communities. Although water dependent occupations are an important source of household income in the peri-urban communities, the demand for water dependent activities is higher in the other three categories of communities (due to high population density; observations in the field and interaction with communities). This made the contribution of water to household income more important in the high, medium, and low infrastructure provision communities, compared to the peri-urban communities.

In the high infrastructure provision communities, there was a very different distribution of the monthly income contribution of water occupations to households. Water dependent occupations contributed between 1-20 % to the total monthly income of 23.1 % of households and between 21-40 % to the total monthly income of 18.4 % of households. However, many households (43.1 %) received a high percentage (over 61 %) of their total monthly income from water dependent occupations which are important sources of household income in the high infrastructure communities.

Table 4.9: Percentage contribution of water dependent occupation to total monthly household income

Percentage contribution (%)	Frequency of contribution (%)				
	Peri-urban (32)	High infrastructure provision (100)	Medium infrastructure provision (62)	Low infrastructure provision (94)	Total sample (253)
1-20	50	23.1	24.2	20.2	25.7
21-40	31.3	18.4	24.2	20.2	22.1
41-60	9.3	15.4	24.2	17	17.4
61-80	9.4	21.5	14.5	20.2	17.8
81-100	0	21.6	12.9	22.3	17

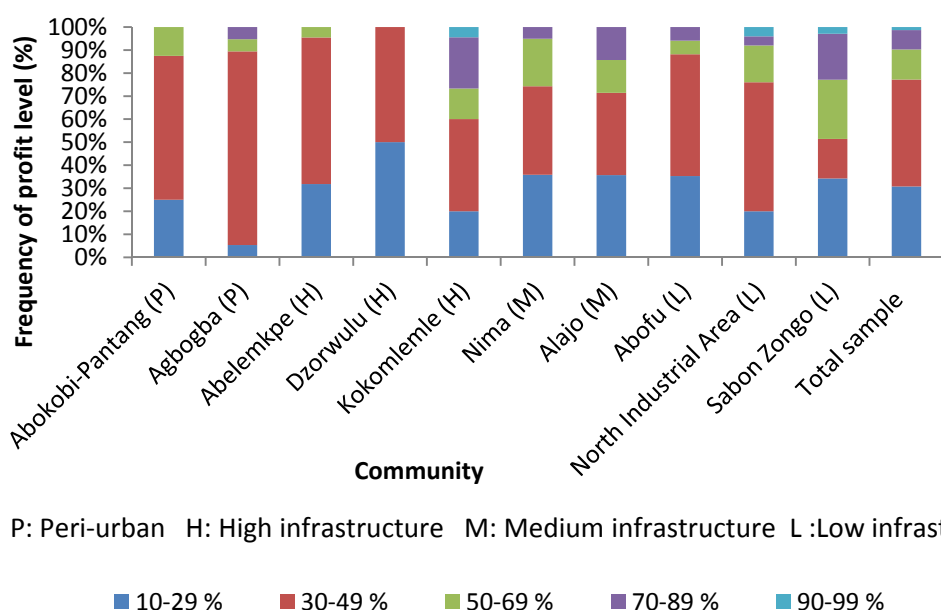
In the communities with medium infrastructure provision, water dependent occupations contributed 1-20 % to the total monthly income of 24.2 % of households; 21-40% of the income of 24.2% of households; 41-60 % of 24.2 % of households; with a more or less even spread over the last two bands (of ranges of contributions). In the communities with low infrastructure provision, there was an even spread of each band to about 20% of households. Here also, water dependent occupations are an important source of income for households with many (42.5 %) receiving a high percentage (over 61 %) contribution to their total monthly income.

In the overall sample, water dependent occupations contributed between 1-20 % to the total monthly income of 25.7 % of households; 21-40% to the total monthly income of 22.1 % of households. Percentage contributions within the other three bands (% contribution) were more or less evenly distributed to about 17 % of the households each. Therefore the evidence from the study indicates that across the city, water dependent occupations are important sources of income to households.

Water dependent occupations profit margins

One factor that keeps households in water dependent occupations, in addition to their importance as an income contributor, are the profit margins (Figure 4.20) accruing to them in their activities.

Figure 4.20: Monthly profits made from water dependent occupations



[Table in Appendix 4.34]

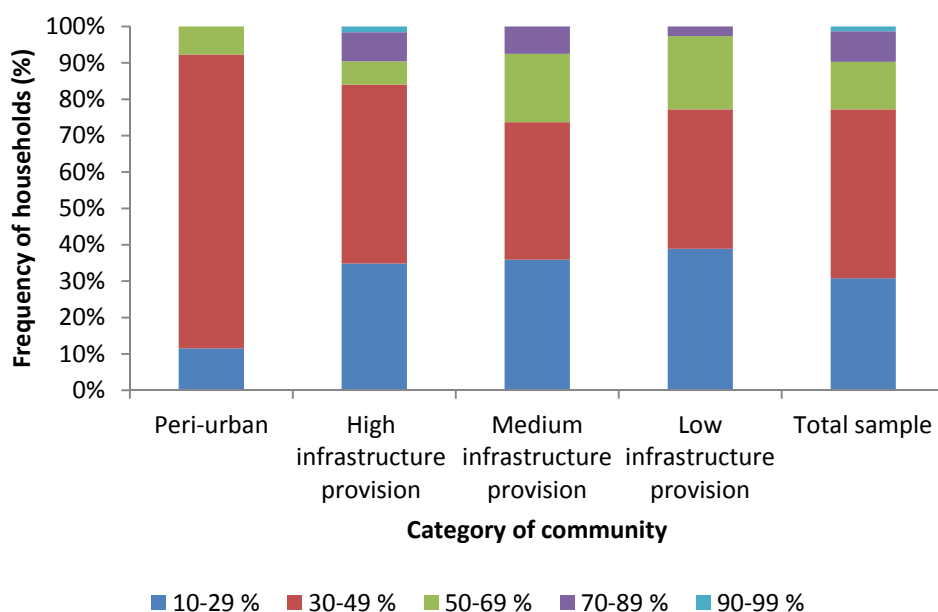
In the selected communities presented in Figure 4.20, the evidence shows that there is some variation in the percentage returns to investments in water related occupations. In Abokobi-Pantang and Agbogba and Abelemkpe, Dzorwulu, and Kokomlemle the majority of households realised monthly profits of between 10-29% and 30-49 %.

In Nima, the majority of households realised monthly profits between 10-29%, 30-49% and 50-69% whereas in Alajo the majority of households realised profits between 10-29% and 30-49%. In Abofu, the majority of households realised monthly profits between 10-29% and 30-49%. In North Industrial Area, the majority of households realised monthly profits between 10-29%, 30-49% and 50-69% whereas in Sabon Zongo, the majority of households realised monthly profits between 10-29% and 50-69%. Therefore interventions to support households would have to design strategies that will move most of them closer to a higher percentage profit margin.

When the monthly profit levels are presented according to the categories of communities, the picture is made clearer. In the peri-urban communities (Figure 4.21, most of the households make between 30-49 % monthly profit from their water dependent occupations; in the communities with high infrastructure provision, the majority of households make monthly profits of between 10-29 % and 30-49 % from their water dependent occupations.

In the communities with medium infrastructure provision, although the majority of households had profits of 10-29 % and 30-49 %, the percentage of households with profits in the range of 50-69 % is also important. A similar trend was observed for low infrastructure provision communities in which the majority of households earned profits between 10-29 % and 30-49 %, but the percentage of households with profits between 50-69% is equally important. This implies that water dependent occupations are profitable.

Figure 4.21: Monthly profits from water dependent occupation in the various categories of communities



[Table in Appendix 4.34]

In the overall sample, the majority of households realised profits between 10-29 % and 30-49 %, but the percentage of households which earned between 50-79 % and 70-89 % are to a lesser extent important. The spread of percentage monthly profits from water dependent occupations across different infrastructure provision suggests that water dependent occupations could be harnessed as a poverty reduction strategy in poor communities if policies ensure that access to water in the right quantity and at the right time is supplied to the city.

In all four categories of communities, supplying the high demand for pure water (sachet water) accounts for the majority of the income from water dependent occupations. However, income from cooked food and hair dressing salon operation tend to be also important. This indeed could help households improve on their socio-economic status.

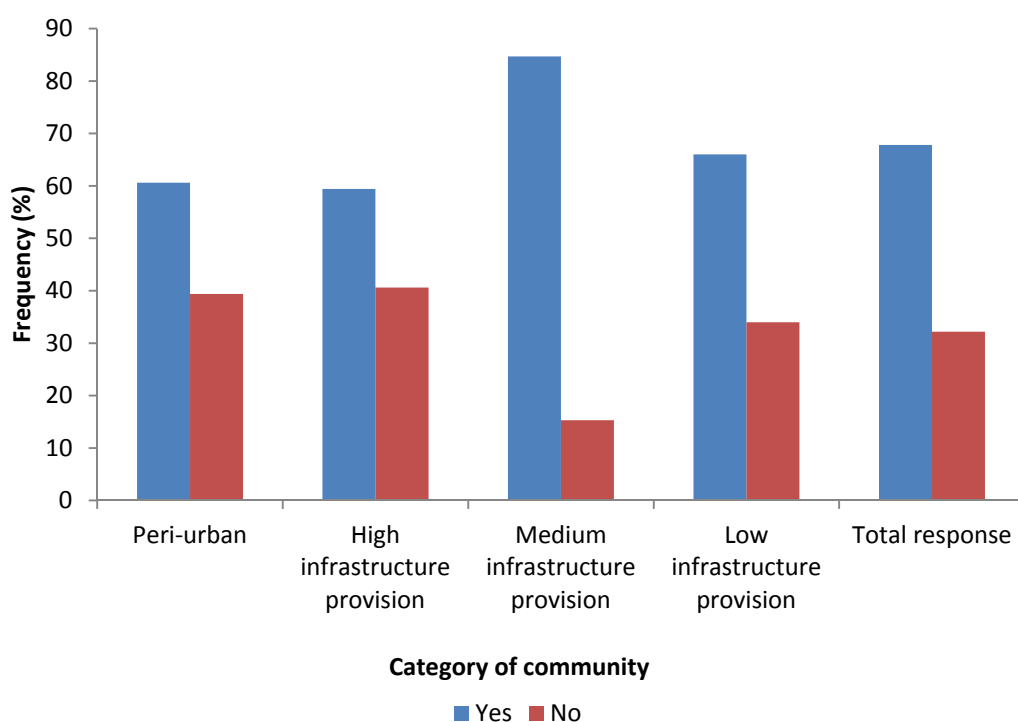
Constraints on water dependent occupations

Similar to other economic activities, water dependent occupations are not without challenges. Appendix 4.35 outlines some of the responses received from respondents to the question: ‘Under what conditions would practitioners expand their water dependent occupations?’ The results showed that most practitioners who responded, preferred some sort of financial capital which once invested, could enable them to acquire any

other input needed, including water. Others desired more customers, which are also related to more income.

Figure 4.22 shows whether practitioners would expand their water dependent occupations if access to water improves. The results indicated a general desire to see that access to water is improved to enable households to expand their occupations.

Figure 4.22: Potential to expand water dependent occupations if access to water improves



[Table in Appendix 4.36]

In all the categories of communities, the majority of practitioners indicated that they would expand their occupations if access to water improved. In each category of community, there was a significant difference between the respondents who answered yes or no, on the perceived potential to expand water dependent occupation if access to water improves or not (χ^2 , 3df=10.915, p=0.012).

Figure 4.22 is explained by Table 4.10, to the effect that most households (79 %) using water directly in their occupation in the peri-urban communities lacked an in-house tap water connection. In the high infrastructure communities, although households engaged in water related occupations have in-house tap water connections (77.3 %; Table 4.10), the majority (about 60 %; Figure 4.22) would expand their occupations if access to

water improved. In the medium infrastructure communities, although up to 55 % of those in water occupations had a tap water connection (Table 4.10), over 80 % (Figure 4.22) indicated that they would expand their occupations if access to water improved. In the low infrastructure communities where up to 46 % of households in water dependent occupations were connected, a little over 60 % indicated that they would expand their occupations if access to water improved.

Table 4.10: Households in water occupations and presence of in-house tap water connection

Response	Frequency of households in water occupation (%)			
	Peri-urban [response=33]	High infrastructure provision [response=66]	Medium infrastructure provision [response=63]	Low infrastructure provision [response=90]
Yes	21	77.3	55	46
No	79	22.7	45	54

Table 4.11 throws further light on this explanation. The reason why the majority would expand their occupation if access to water improves (in spite of the current level of connection) is that apart from the high infrastructure communities, the majority of households engaged in water dependent occupations accessed water at private charges. Improved access to water perhaps may allow them to access water at the PURC rate (which is up to 10 times less than the private charges).

Table 4.11: Households in water dependent occupation and the rate (PURC) or charges (private) at which water is accessed for occupations

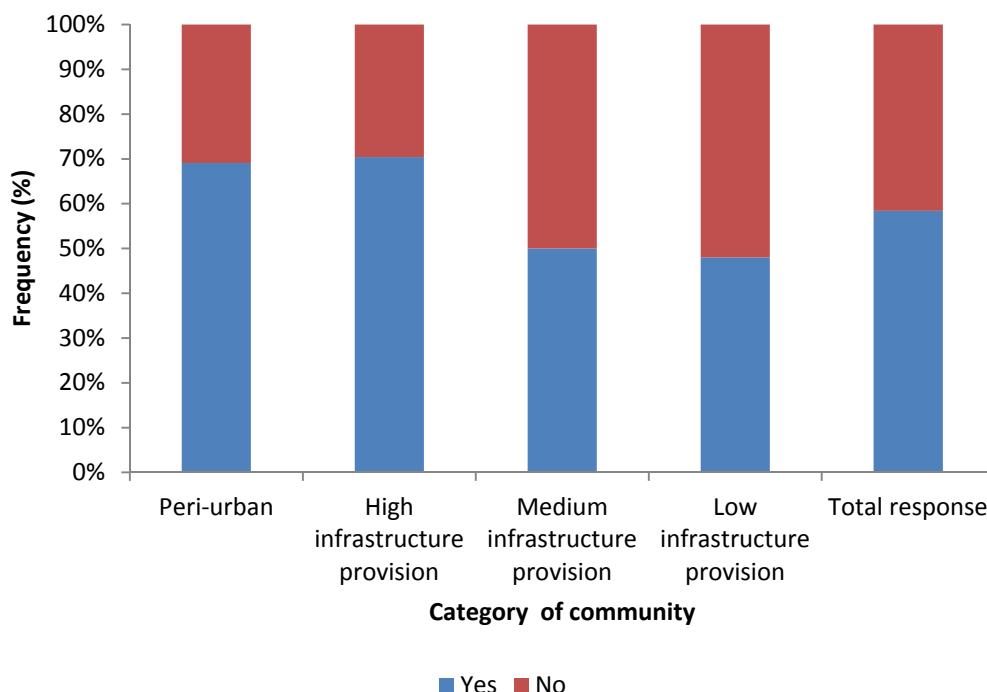
Response	Frequency of households using tap water in their occupation (%)			
	Peri-urban [response:10]	High infrastructure provision [response=25]	Medium infrastructure provision [response=36]	Low infrastructure provision [response=51]
PURC rate	10 %	44.4	33.3	15.7
Private charges	90 %	45.6	62.7	84.3

As to why some will not expand their occupation even if access to water is improved could be explained by reference to Figure 4.17 which indicates that a percentage (42.4 % in the total sample) of those involved in water occupations deal in sachet water vending (which is already bagged from the vendor): the distributions are - in the peri-urban (48.5 %); high infrastructure provision communities (43.9 %); medium infrastructure provision communities (44 %) and low infrastructure provision communities (37.6 %).

Other elements of financial capital

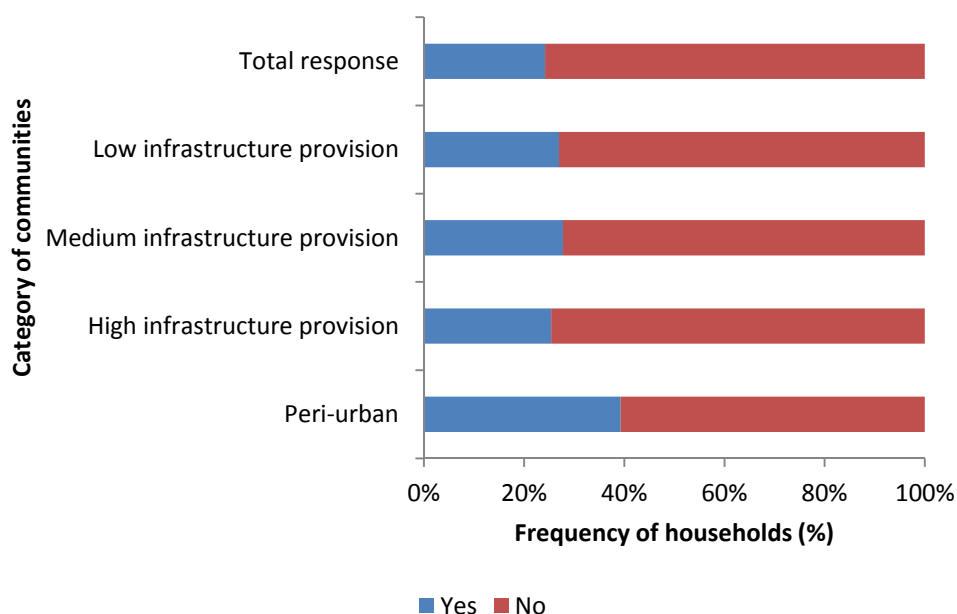
The majority of respondents indicated that at least one household member has a bank account (Figure 4.23), implying that households with good credit ratings or a steady flow of income could have access to credit from the banks. Comparatively, fewer households belong to other savings groups (Figure 4.24). Nonetheless, savings groups also provide an avenue for some households to access credit from both the formal and informal markets. Households are usually cautious on what financial details to share with external individuals.

Figure 4.23: Household ownership of bank accounts



[Table placed in Appendix 4.36B]

Figure 4.24: Household membership of other savings groups in the different categories of communities



[Table in Appendix 4.37].

4.2.3 Surface and other alternative sources of water [natural assets]

The challenges over accessing water in the peri-urban community compel households to consider the use of alternative sources. Some peri-urban communities including Abokobi-Pantang and Agbogba are endowed with rivers and pond systems of suitable quality for some domestic activities such as washing, cleaning, and bathing. In addition to the river, Abokobi-Pantang has several ponds from which inhabitants draw water for various domestic activities.

During fieldwork it was observed that a well by the river in Agbogba offers a higher water quality [safe for some domestic activities] than the river, and therefore inhabitants fetch water from this well. Water is drawn from the river and the well by tanker drivers and sold to households or construction companies. The care taker of the well sells the water to the tanker drivers, but allows free use by inhabitants of the community [the well and the point for drawing the river are at the same location]. Therefore in peri-urban communities where the water is of a good quality [safe for some domestic activities apart from drinking] and people use it for domestic or commercial activities, interventions must factor in these uses in the communities.

‘For about 8 years taps have not flowed in some of the houses so some of us who live close to the well by the river use it for some domestic activities apart from drinking. The well was dug and managed by someone who lives outside the community. As a way of maintaining a good relationship with community members, he allows them to fetch for free’. ‘I depend on the well on the banks of the river’ (men’s and women’s focus groups, Agbogba).

These sources of water offer opportunities to the relevant communities to put in place measures that will secure the water for use when needed. When a water resource serves a useful domestic or commercial purpose, users, especially are interested in the continuing availability of the resource and therefore likely not to act in a way that make the resource unusable. The same cannot be said of non-users who may place no value on the water.

Though there have been some changes in the different activities for which surface water is used, the water continues to serve useful purposes in the two peri-urban communities. Therefore the preservation of the water sources offers the opportunity to access water of sufficient quality for free. The water can be used for various domestic activities to augment tap water, which is paid for, and also during periods when tap water stops flowing. Further discussion on water conservation practices are presented in chapter five.

Rainwater harvesting also offers some opportunities in the peri-urban areas. Rain water is collected in household containers. Several ponds in Abokobi-Pantang collect run off (under gravity) which is used by the community. Prior to the availability of tap water, rainwater harvesting played a major role as a water source and continues to augment treated water supplies.

‘... when the tap is not flowing then we resort to the ponds’. ‘Water sources include tap water; ponds, river, and individually hand dug wells’(women’s and men’s focus groups) ‘In the earlier times, water sources for Abokobi-Pantang were rainwater collected into barrels and ponds. The Dakobi [river] is for washing; in the past it was for dinking’ (women’s focus group) (see also section 4.3.2; the theme: urbanisation and its consequence on local economic development).

In Dzorwulu, the surface water is used for crop cultivation by urban farmers and sections of these farms are protected from solid and human waste disposal by non-community members who are the main sources of pollution to the community. Therefore in Accra, one way of protecting these water sources is to create some uses for

them or project them as a resource of a particular value as is being done also at the Korle Lagoon area through the ecological restoration project (see section 2.3.1).

Urban Agriculture plays an important role in the socio-economic activities of the city. Two important requirements- land and water in the city, challenges the opportunities available to urban farmers. While land available is being taken over by other developers in the city, surface water which is used by urban farmers continues to be polluted. In section 2.3.2, some of the work done in relation to crop contamination from polluted water was presented.

The Sustainable Water Management Improves Tomorrow's Cities Health (SWITCH) project approached the problem at two levels. The first level has been to look at water management at the catchment level (which constitutes this PhD). The second was to consider on-farm innovations in water treatment so farmers can have access to clean water (for an overview of the SWITCH project, see <http://www.switchurbanwater.eu/>).

Farmers in Dzorwulu live outside the community and yet have a cordial relationship with the community which has allowed them to cultivate the land for so many years [lands in Dzorwulu are actually beneath high tension electric cables and therefore illegal for any estate development].

Among the communities which were sampled, there are opportunities to secure lands for crop cultivation in the peri-urban communities. However, this would require direct policy interventions. This is important because there is the availability of water of safe quality for crop cultivation. However access to lands for farming is a problem. In Abokobi-Pantang for example, the ownership and sale of land is a problem. Many farmers have lost lands for farming because they have been sold to estate and other private developers. There are threats of future sale of what remains. The other communities sampled in Accra are all built up communities without any lands for crop cultivation but play important roles in maintaining safe water quality (see chapter five).

4.3 HUMAN AND SOCIAL CAPITAL AND THEIR INFLUENCE ON HOUSEHOLDS' OCCUPATIONAL CHOICES

Using the Livelihoods Framework as a theoretical basis (discussed extensively in chapter two; section 2.1-2.1.8) for the study into people's livelihoods, encourages an investigation of different aspects of human and social capital which households draw on in decisions and choices affecting their water dependent occupations (as well as other occupations and activities). This is the rationale for including this section in the investigation and the presentation.

Chapter four in general, as mentioned earlier, combines results of the focus group discussions and the household interviews. The issues discussed under this section are from the focus group discussion component of the study, except the section on social capital and local perceptions of wealth and poverty where analysis of the household questionnaires has been incorporated. In the presentation, themes are **bold typed** whereas concepts or ideas are in *italics* and indicated accordingly (see section 3.2.1 to 3.2.1.3; Table 3.8; and Appendix 3.7; on how the focus group discussions were analysed).

4.3.1 Personal Choices, Parental support and Education

The relevance of **innate abilities and personal choices (theme)** in relation to occupations was distilled from focus group discussions at Abokobi-Pantang (peri-urban), Kokomlemlle (high infrastructure provision), Nima, Alajo (all medium infrastructure provision), Abofu, North Industrial Area, and Sabon Zongo (all low infrastructure provision). According to local perceptions, individuals' endowments structure their interest and choices for specific occupations.

'Someone going to school says that I am perfect in this and that, so that is what I will do'.'To someone, the qualification allows him/her to do farming or take up after his/her parents' (mixed focus group, Abokobi-Pantang).

The young adults' focus group discussions also indicated that occupational choices are determined by the *personal talents and preferences of individuals [concept/idea]*:

'Talents in the field, interest and survival strategy to achieve a goal' (influence occupational choices) (young adults' focus group, Abelemkpe).

'Sometimes people come up with their own vision and once they go into it they are able to do it' (young adults' focus group, Kokomlemle).

The lack of opportunities in the formal employment sector compels individuals to consider other alternatives in the informal sector. Under such circumstances, some people, including both young and old, set up small businesses to earn income for their households. This also enables people to develop their business and entrepreneurial skills. In any particular community, certain economic activities are common and these may also influence some of the informal activities that people do, especially if there is high demand for the products and services of such an occupation.

This is common in Nima (car washing, informal laundry services, hairdressing, food vending, water vending, hand craft and art work production and vending, pure water vending [sachet water], batik tie and dye cloth production, trading among others: see section 3.4.3), but has wide application in the entire city. It is also an avenue for people to make quick returns on their investments. According to local perceptions, lack of credit and low patronage of products may be a threat to prospective entrepreneurs.

Under circumstances where people cannot access such local opportunities, they have to look outside the community. Access to occupations in the formal sector often depends on the level of education and skills of individuals. For people who are trained in one profession or the other, accessing job opportunities in the formal sector may not be as difficult as for those without any formal qualification. Individuals may have to change their occupations in the course of time because of low returns and this can be a discouragement (local perceptions). According to local perceptions on employment which was discussed, certain attitudes to jobs, including laziness and being very selective about occupational choices can lead to low productivity or lack of employment.

In Abokobi-Pantang (peri-urban), Abelemkpe, Dzorwulu, Kokomlemle (all high infrastructure provision), Nima, Alajo (all medium infrastructure provision), Abofu, North Industrial Area, and Sabon Zongo (all low infrastructure provision), a second theme which was generated from the focus groups was **parental support and influence**. The extent of the support from parents depends on their resource base, experiences, and ambitions for their children and the norms within the community. This support is also grounded on the understanding that children, youth or young adults will

cooperate with their parents or guardians. Parents may discourage their children from doing anything apart from what they [parents] consider as good for them.

'In some households the parents may be in a certain job and they will influence their children's jobs' (mixed group, Abelemkpe).

In this context, the young men and women work closely with their parents and some are influenced eventually to take after their parents' occupations.

'There is a practice in this community where the young women work with their mothers and most of the time they end up doing similar occupations' (mixed focus group, Nima).

'I think that when your parents are in that job and they initiate you into it that influences your occupational choice' (young adults' focus group, Sabon Zongo).

Therefore personal talents and aspirations have to be pursued consistently if they conflict with the parental ambitions. Sometimes decisions and ambitions of the young adults are premised on self-centred motives (motives considered not to be driven by sincere quest to develop personal strengths and abilities) and therefore parental guidance is important for shaping this orientation.

'For some people their choices are based on envy, may be their friends have made money in business and since schooling takes time to bring money, they drop out of school to do business in order to compete with the person' (women's focus group, Sabon Zongo).

In the case where young individuals fail or refuse to cooperate with their parents and guardians, or no common ground is attained, then they risk losing a vital opportunity. In Abofu for instance, some young adults, failing to cooperate with parents or guardians are known to indulge in substance abuse (drugs) and therefore ruin their future (In rare cases, parents may allow wayward youth and young adults to have their way and risk being trapped in poverty:

'Stubbornness makes it difficult for the elderly to help the young adults'. How can my mum support me?'(mixed focus group, Abofu). *'There is lack of parental care such that if the children grow a bit, especially the male youth or young adults, the parents just leave them. Some of the youth in this area are stubborn and so their parents just leave them (young adults', Abofu). There are drug peddlers and addicts in this community and these contribute to the crime level usually targeting strangers to the community',* (young adults' focus group, Abofu).

The young adults' focus groups agreed with the mixed focus group about the perception of stubbornness and its consequences in Abofu.

Often, individuals may fail to take up the parent's job for good reasons such as the low income of such occupations or the extent of perceived risks. The young adults are also under peer and community influence. Depending on what a group of young adults is pursuing and what is considered in a particular community as important or as fashionable, the young adults may pursue similar activities to fulfil the peer expectation or pressure, as was observed in Dzorwulu (high infrastructure provision). On the down side, these pressures may result in outcomes such as high rates of teenage pregnancy which may delay or deny opportunities. Influence from peers can be positive or negative in getting the young adults to become what their parents' desire for them [drug use in Abofu for example can deny the youth or young adults of realising their career ambitions, see quote above].

'The youth lack support to [go to] school (young adults' focus group, Abofu)

Support could also be in the form of informal mentoring from community members who have excelled in their occupations.

'One of the factors which has influenced choice of occupation in the community has been the influence from informal mentoring' (young adults' focus group, Kokomlemlle).

Certain occupations are also age determined and will take people with certain minimum fitness because they involve a lot of manual activities (construction activities, manual carrying of loaded sacks. Others are gender determined (female hair dressing—that is washing and styling).

'Age is a factor. The young adults have a lot of energy so they do a lot of manual work. Gender is also a factor. Women young adults only are hair dressers' (mixed group, Sabon Zongo).

Discussions in Abokobi-Pantang (peri-urban), Dzorwulu, Kokomlemlle (all high infrastructure provision), Nima, Alajo (all medium infrastructure provision), Abofu, North Industrial Area, and Sabon Zongo (all low infrastructure provision), indicated that parental support and influence is also related to **education and human development [theme]**. There are opportunities in the informal educational sector for individuals to train as artisans and other entrepreneurs to secure their future. Education creates opportunity for people in the formal sector. Education enables people to develop sufficient skills for their respective occupations:

'Choice of occupation is influenced by poverty, pressure from parents, peer pressure, role models, [and] level of education which determines the capacity people have built' (young adults' focus group, supported by the mixed focus group, Dzorwulu).

'The level of education influences choice of occupation. 'May be the parents are unable to help the children to continue'. 'I encourage the youth to [go to] school' (mixed focus group, Dzorwulu).

'Education is a key determinant'. School dropouts in the area are in apprenticeship, training as artisans whereas the highly educated are in the civil and public sector' (mixed focus group, supported by young adults' and women's focus groups, Kokomlemle).

'The nature of occupational activities is influenced by the level of education'. 'People struggle to pay school fees and as such after basic or secondary education, they are unable to continue'. 'I think that when this happens parents let their children train as artisans'. 'I have a daughter who had to work and sponsor her education in the Teacher Training College and the University. She had one daughter, so what I did for her was to take care of her daughter to allow her to go to school' (mixed focus group, supported by young adults' focus group, Alajo)

'What influences the choice of job is knowledge in the field of experience. Low level of education may cause people to do their own work' (mixed focus group, North Industrial Area).

In a city context, people must have hands-on experience in order to build their experience over a period of time. In some communities, such as North Industrial Area, interest in education by the youth and young adults is so low to the extent that it affects opportunities available to them in the community and the city.

'School dropouts are compelled to train as artisans or to do some activity to live'. 'Lack of education is a limiting factor' (men's focus group, North Industrial Area).

Among people who have dropped out of school, some engage in their own businesses to raise income for their households. This helps to develop the entrepreneurial capabilities of individuals. Individual ambitions or personal goals may drive forward the entrepreneurial capabilities.

The level of education and skill is developed over time:

'The predominant factor in determining what one can do is education'. 'I know that those without education train as artisans to get something for a living' (mixed focus group, supported by women's focus group in Sabon Zongo).

Education is a determining factor. So it is appropriate when expressed in the statement below:

‘Education is very important in determining what people can do’ (young adults’ focus group, Nima).

Parental illiteracy makes it difficult for some [parents] to appreciate the value of education and this could go a long way to affect the individual. This was especially noted by young adults:

‘The illiterate mindset is still a problem. Some do not see the importance of education’. ‘Though they may have money or can make some efforts to help their children, may decide to involve them in farming activity’ (young adults’ focus group, Abokobi-Pantang).

4.3.2 Financial Support and Local Economic Development

In Abokobi-Pantang, Agbogba (peri-urban), Abelemkpe, Dzorwulu, Kokomlemle (all high infrastructure provision), Nima, Abofu (all medium infrastructure provision), and North Industrial Area (low infrastructure provision), occupational choices are also influenced by the level of available *financial support and the coping strategies followed/adopted (theme)* as distilled from the focus group discussions. The secure financial base of households enables them to access and pay for relevant services. In cases where households depend on low income occupations and the source of income is seasonal in nature, they will have low and intermittent/income flow. Such households may be financially strained if efforts are not made to move up the economic ladder.

‘Factors which influence occupational choices are financial problems, family conditions and lack of money’ (men’s focus group, North Industrial Area).

This compels households to adopt various measures that will enable them to cope with the economic and financial situation. Therefore it is common that in peri-urban and urban environments, there are some households who are engaged in a productive activity as primary, secondary or even temporary occupation with the intention of raising some capital for further education and skill development to allow them to improve on their income and assets status. In some instances, the capital is to enable investment in a different occupation to improve the income flow of the household:

‘Some of those in farming do so to save money for business or to train as artisans’ (young adults’ focus group, Abokobi-Pantang).

Households may also decide to accord some members the opportunity to go to school, while the others are made to train as artisans due to the financial constraints being encountered. Households aspire to improve their income flow and therefore choices are sometimes made as a *coping strategy (concept/idea)*. People's daily schedule may therefore include more than one occupation. Occupational choices can also be to enable households cope with a current situation in preparation for a future opportunity.

'I think that those who want quick money go into businesses'. 'There are some who for lack of money go into business to save money and then go back to school'. 'Others also train as artisans and make money and then stop to do businesses' (young adults' focus group discussion, Sabon Zongo).

Financial resources make investments into formal and informal education possible. Without such resources, households can support the education and skill development of their members only to a certain level. A sound financial base offers opportunities to achieve livelihood goals. The situation is quite critical when households are very poor; in that case, members are compelled to take decisive and timely action to improve their income status. This relates to the issue of *occupational prospects and income stream (concept/idea)* [as generated from the focus groups], where members simply have no choice in terms of occupation, it is a matter of survival first and therefore welfare of the family is placed ahead of the individual interest of household members. This was common at both Abokobi-Pantang and Agbogba.

Occupational choices are also determined by ***urbanization and its consequences on local economic development [theme]*** (see section 4.3) which was generated from focus group discussions in some of the communities. Urbanization has put pressure on lands within the city. Consequently, the peri-urban communities, such as Abokobi-Pantang and Agbogba offer an opening for households to acquire lands for different development projects. This situation has made productive activities based on land quite unprofitable for community members because of limited lands for farming and these are also threatened with sale in the near future.

'In those days that development was yet to catch up, the only thing one could do was farming. Presently there are challenges facing the farmers. Due to development, farm lands have been sold, so farmers have limited lands to farm' (men's focus group, Abokobi-Pantang).

Therefore, given this historical trend and its related threats, opportunities in farming have been constrained, compelling households to expand their capital base by considering alternatives. This relates to the social networks available to the community where some non-governmental organizations have introduced support packages to help build up the natural capital [livestock keeping] base of some households in Abokobi-Pantang. In Abokobi-Pantang, informants indicated that they had lost lands meant for agriculture to estate developers. A Non-Governmental Organisation, Heifer International had intervened to support some households with livestock for rearing. This effort to help households expand their natural capital base was a relief to some of the affected households who have benefited from the support.

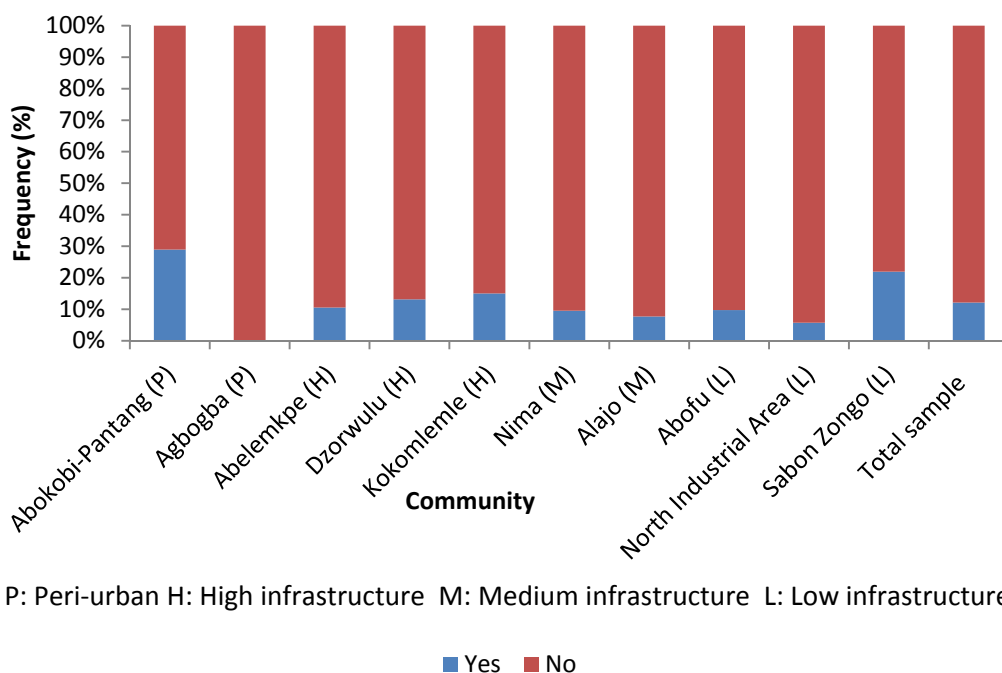
4.3.3 Social Capital

In relation to social networks, issues that emerged from focus group discussions at all ten communities were the presence of *support driven occupational associations, other social associations, residential associations, faith based organizations, and cordial relationships among community members (concepts/ideas)*. Such associations may often have a mandate of promoting community involvement in development or to mobilize people for specific activity such as Keep Fit Clubs.

4.3.3.1 Occupational associations

The peri-urban community offers a dynamic environment where local associations emerge in response to specific community needs. Some associations, seeking to unite people involved in various occupations, have evolved, especially in Abokobi-Pantang, Dzorwulu, and Nima. These tend to have rules which require membership dues to be paid regularly. As part of the rules, the leadership of the associations have to liaise with Non-Governmental Organizations which assist community based associations with financial or direct occupational support (such as ActionAid Ghana, Heifer International [who support membership with livestock], Kraban Loans—offer loans to membership) to enable membership to increase productivity. Occasional support is also expected from the associations. Some of the associations are specifically for women or men, others have a majority of one sex or the other because of the gender linked nature (such as ascribed responsibilities as in market women’s association). Figure 4.25 presents the involvement of households in occupational associations in the communities.

Figure 4.25: Households' involvement in occupational associations



[Table in Appendix 4.38]

In the peri-urban communities, at Abokobi-Pantang, up to 30% of households were involved in occupational associations. The focus group discussions showed that there were farmers and traders associations in Abokobi-Pantang. Those involved in farmers association had existing arrangements for members to have their farmlands cleared of weeds before cropping. The cost was however borne by the individual farmers. In the high infrastructure communities, a lower percentage (up to 10 %) of households than Abokobi-Pantang was involved in any occupational associations.

'I belong to the hair dressers and beauticians association, and the association meets outside this community' (women's focus group, Kokomlemle).

'Some of the associations in Nima are hair dressers association; tailors association (mixed focus group, Nima). 'There are local restaurants (popularly known as "chop bar") operators, seamstress, and hair dressers associations to mention a few'. 'For one to be admitted into any livelihood association he /she needs to be a practitioner. To become a member of the hair dressers association, one needs to fill a form and pay the appropriate contributions' (women's focus group, Nima).

In the medium infrastructure provision communities, households' involvement in occupational associations was lower (not more than 8%) in both Nima and Alajo than at Abokobi-Pantang. In the low infrastructure communities, a higher percentage of households were involved in occupational association at Sabon Zongo (25%) than Abofu and North Industrial Area.

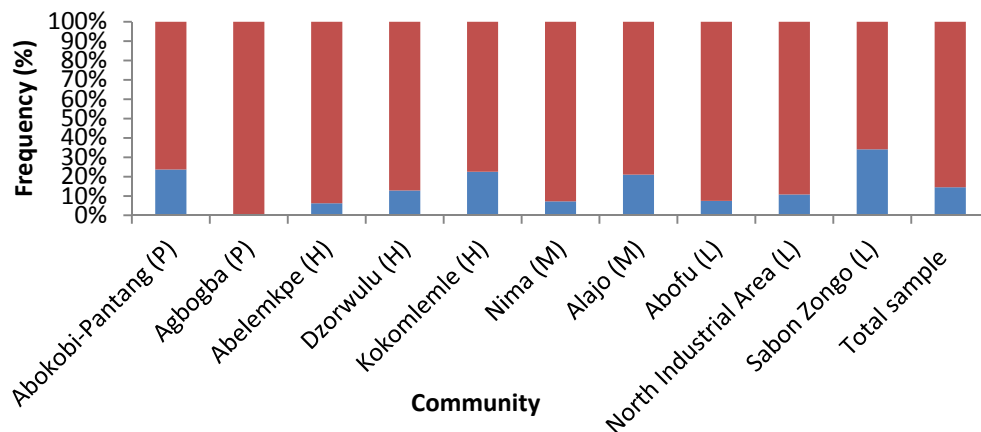
4.3.3.2 Households' involvement in other associations

Experiences in the formation of community watchdog committees vary across the city, however in the case of Agbogba, what was established in the past could not be sustained for several reasons. One explanation offered was the difficulty the group encountered in encouraging members to honour their regular contributions to the association. Consequently, the association could not meet its basic overhead cost and collapsed. Furthermore, the community participation and the dedication needed to sustain the association were absent. Since the majority of the houses within the community are surrounded by a wall with gates, interaction among community members is limited and therefore not on the scale of Abokobi-Pantang. The community has an opportunity to learn from the causes of the failure of the association in the past.

'A community watchdog committee formed some time ago collapsed because of lack of funds. Many churches exist in the community' (men's and women's focus groups, Agbogba).

Figure 4.26 below presents the involvement of households in other associations (such as community watchdog committees, residential associations, and youth associations, Keep Fit Clubs, among others) in the communities.

Figure 4.26: Household's involvement in other associations in the community



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure

■ Yes ■ No

[Table in Appendix 4.39]

Figure 4.26 shows that in the **peri-urban communities**, some households' members were involved in other associations in Abokobi-Pantang (24%) whereas none of the households in Agbogba indicated membership of any other association. In the **high**

infrastructure communities, a higher percentage of households were involved in other associations in Kokomlemle (24%) than in Abelemkpe and Dzorwulu.

‘There is the Keep Fit Club. Neighbourly relationships are also good’ (mixed focus group, Dzorwulu).

‘We do not know of any associations and neighbours also live at peace with each other’ (mixed focus group, Kokomlemle). *‘Apart from the Keep Fit Club; there is no other association that I am aware of in the community. The relationship between neighbours is cordial’* (young adults’ focus group, Kokomlemle). *‘There used to be residents associations but due to laxity on the parts of the residents, this is not functioning any more’* (men’s focus group, Kokomlemle).

In contrast to Agbogba, in Abelemkpe and Dzorwulu, residential associations appeared to remain functional. Residents’ associations offer community members the opportunity to discuss relevant issues concerning community safety especially and to maintain and improve the physical conditions of the community. Social associations in Abelemkpe and Dzorwulu, such as the Keep Fit Club and the drumming group respectively, offer some basic support to members in times of difficulty through the monthly contributions of members. Such associations also create opportunity for unity among youth and young adults and are important resources for promoting community participation in water and environmental pollution control [discussed in chapter five].

In the medium infrastructure communities, the percentage of households involved in other associations in Alajo (24%) was higher than at Nima (Figure 4.26), although residential associations and other associations in Nima were functional.

‘I am aware of the Keep Fit Clubs. They do engage in soccer on Sundays. Apart from that there are also tribal meetings’. ‘I do not attend these meetings so may know very little about them. Good relationships exist between neighbours. In cases where there are misunderstandings between neighbours, they do not degenerate into permanent conflict but they are resolved with the support of other neighbours’ (mixed focus group, Alajo).

Some of the associations are “One Love” [This association focuses on the social issues of members], Keep Fit Club, and several women’s groups. Those excluded from these associations are people who cannot abide by the laid down rules. ‘In the “Zongo” [where houses are haphazardly placed] part of the community, there are a lot of quarrels because of the density of people, this is not so in other parts because in such areas individuals keep to themselves’ (young adults’ focus group, Alajo). *‘Good relationship between neighbours is observed at some parts whereas in some parts there are quarrels and gossips’* (women’s focus groups, Alajo).

'Some of the associations are watchdog committees; political associations, religious associations; cooperatives; neighbourhood association-in this association one who is not well behaved is excluded' (mixed focus group, Nima).

'Some of the associations include Real Zaragoza (what may exclude one from being a member are lack of commitment and having a criminal record). This association, comprising mainly of the young adults in the community carry out clean up exercises, and encourage discipline among others'. 'Neighbourhood volunteers work all the time with the police to assist with security'. 'Yempaba Islamic Brotherhood is a religious association and therefore women and non Muslims are excluded'. 'The Ghana Red Cross Society carries out educational campaigns on ensuring community cleanliness (young adults' focus group, Nima).

In the **low infrastructure provision communities**, the percentage of households (38%) involved in other associations at Sabon Zongo was higher than at Abofu and North Industrial Area (Figure 4.26). In all selected communities, there was less frequent interaction among households where majority of houses were surrounded by a wall with gates (such as Abelemkpe, Dzorwulu, Kokomlele, and Agbogba) than among the ones that were not surrounded by a wall with gates. In communities where there was frequent interaction (such as Abokobi-Pantang, Nima, Alajo, Abofu, North Industrial Area, and Sabon Zongo), potential and observed social capital was high.

'In general there is good relationship between neighbours and there is no discrimination from individual community members'. 'There is one that we know of, the Avenor traders association' (men's focus group, North Industrial Area).

'There is Naziac-football association-women and those who are not disciplined are excluded' (young adults focus group, Sabon Zongo). 'Some of the Associations are Planned Parenthood Association of Ghana Peer Educators, Makola Youth Club, (women's focus group, Sabon Zongo).

4.3.3.3 Faith based associations

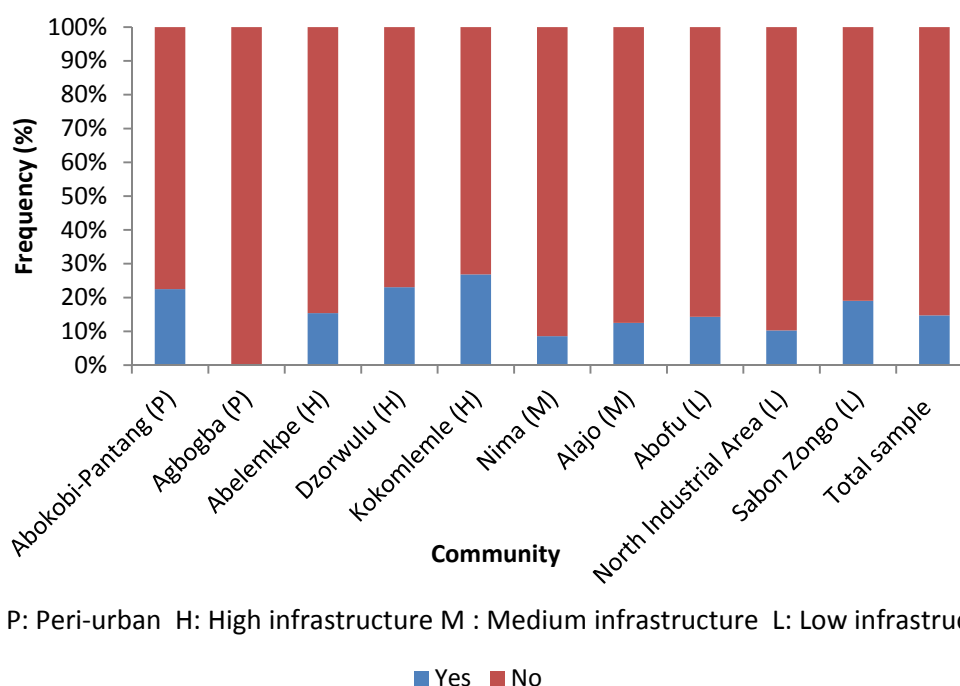
Faith based organizations support the spiritual development of community members. These organizations are common in both the urban and the peri-urban environment. Religious associations may exclude those not professing the faith and women in Islamic associations, except where there are associations for women only.

'Religious associations also exclude those not practicing the religion (mixed focus group, Nima).

Figure 4.27 presents the involvement of households in religious leadership (a religious leader in this context refers to all those with official leadership roles in their religious

organisations-such as Pastors, Priest, Elders, Committee leaders, Imam, etc) in the communities.

Figure 4.27: Households’ involvement in religious leadership



[Table in Appendix 4.40]

In the **peri-urban communities**, the involvement of households in religious leadership was up to 22% in Abokobi-Pantang whereas no households’ members were involved in Agbogba. In the high infrastructure communities, Dzorwulu (22%) and Kokomlemle (28%) (Figure 4.27) both showed higher involvement of households in religious leadership. These are communities with majority of households reporting as Christians (Appendix 3.6).

In the **medium infrastructure provision communities**, percentage household involvement in Nima (10%) and Alajo (12%) were lower compared with Dzorwulu and Kokomlemle. In the **low infrastructure provision communities**, Abofu (13%) and Sabon Zongo (20%) (Figure 4.27) showed some degree of household involvement in religious leadership. The majority of households in Nima and Sabon Zongo reported as Muslims (Appendix 3.6).

‘There are quite a number but two Islamic ones are Yapi and Ramani’ (men’s focus group, Sabon Zongo). ‘Associations in the community include: Mallam ways which

preach on Islamic values, non Muslims are excluded and Sisse and Jelo faith based associations' (young adults' focus group, Sabon Zongo).

All the communities are active in religious activities. Religious leaders are usually accorded much respect and honour. They are therefore important in driving forward change in community household behaviour. Across all ten communities, there was a cordial relationship among community members and this is important for community interaction and development, to the extent that in a case of a misunderstanding between community members it does not degenerate into a permanent conflict. Existing social connectedness enables the community to resolve such conflicts which crop up occasionally. This cordial relationship among community members also enables households without tap water connections to access (purchase) water from their neighbours.

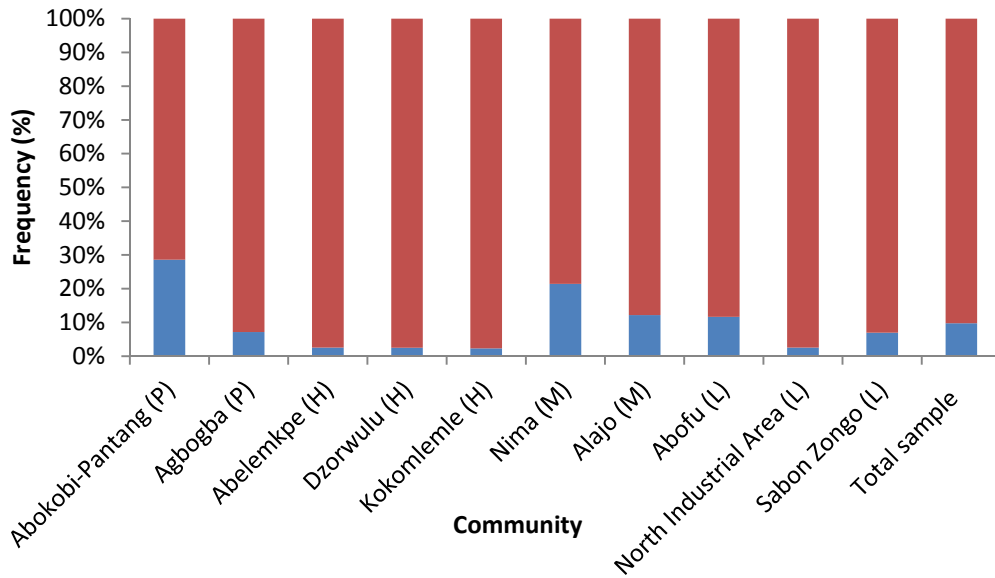
4.3.3.4 Community leadership

Figure 4.28 presents household involvement in community leadership (a community leader is a recognised Assembly member, community watchdog committee member, holder of a chieftaincy, and other leaders of groups which seek community development of some sort). In the **peri-urban communities**, though the percentage of households involved in community leadership was low, it was relatively higher at Abokobi-Pantang (28%) than at Agbogba. There was a leadership problem in a section of Abokobi-Pantang, concerning a chieftaincy dispute. The chieftaincy dispute is believed to have been the reason behind relaxation of certain traditional conservation practices discussed in chapter five.

'There is no chief, the previous one died'. 'There is a chieftaincy dispute'. 'There used to be communal labour in the past but not today' (mixed focus group, Abokobi-Pantang).

Many households in Agbogba were surrounded by a wall as compared with Abokobi-Pantang. Therefore the low level of community interaction at Agbogba possibly accounted for the low involvement of households in community leadership. A community watchdog committee set up for Agbogba also collapsed (as mentioned above).

Figure 4.28: Households' involvement in community leadership



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure

■ Yes ■ No

[Table in Appendix 4.41]

In the **high infrastructure provision communities**, the involvement of households in community leadership was extremely low, although both Abelemkpe and Dzorwulu had a form of community association. In the **medium infrastructure provision communities**, the percentage of household involvement in community leadership at Nima (22%) was higher than Alajo (13%). The percentage household involvement in Nima and Alajo was higher compared with the high infrastructure provision communities. This could be explained by the fact that most houses are not surrounded by a wall in Nima and Alajo and also there was more community interaction (as mentioned above). There are many more associations also in Nima than the high infrastructure provision communities. This was observed during field work and interaction with community members. This perhaps made it easier for household members to be noticed and also volunteered to serve in various leadership roles.

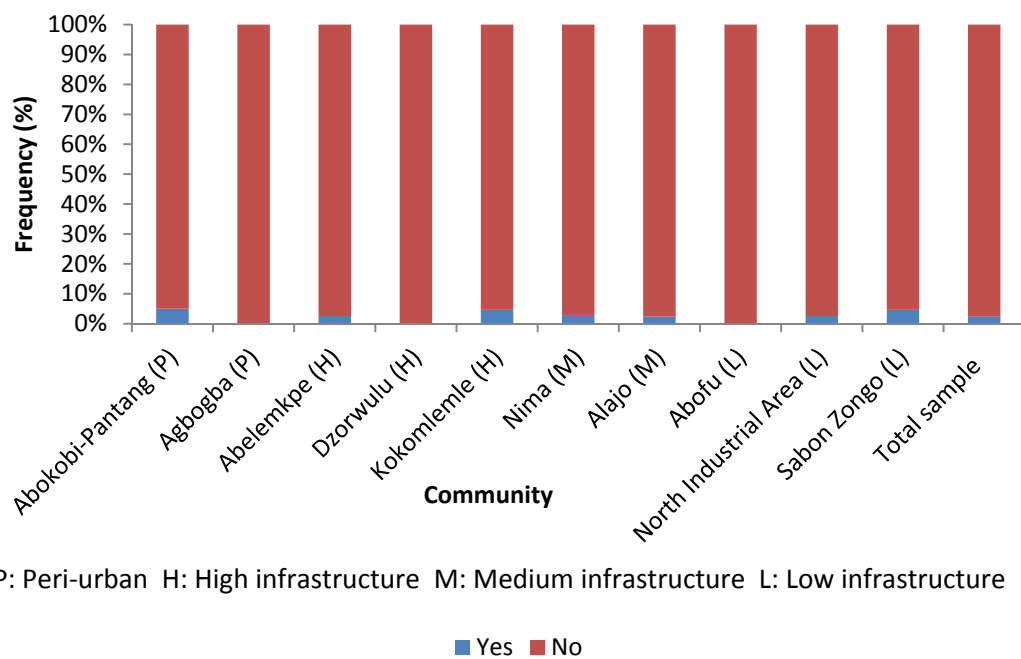
In the **low infrastructure communities**, the interaction among community members was similar to the medium infrastructure communities as indicated above). The percentage involvement of households in community leadership in Abofu (13) was similar to Alajo. Percentage household involvement in community leadership was low at North Industrial Area and Sabon Zongo, though most houses were not surrounded by a wall and therefore there was frequent interaction among community members. There

were many more associations in Sabon Zongo than all communities except Nima. It must be noted that in terms of community leadership it was not anticipated that every households will have a representation in it per se.

4.3.3.5 Political leadership

Figure 4.29 presents households' involvement in political leadership in the communities.

Figure 4.29: Involvement in Political leadership



[Table in Appendix 4.42]

This involves all forms of government appointments in local government, public and civil services. The percentage household involvement was low (less than 5%) in all the different categories of communities. Involvement of community associations in environmental behaviour change is discussed in chapter five (where social capital application in the community is explored further).

This section discussed some dimensions of human and social capital and indicated how important they are in determining what skills and knowledge people acquire in order to access existing occupational opportunities. Occupational strategies and choices are often made by people aspiring to have a better life and ensure improvements in basic indicators of well-being. Social capital also helps people to create opportunities in the water sector and also access water for both domestic and commercial activities. Social

capital is also important for community behaviour change which is discussed in chapter five. Therefore its understanding is important for any future proposed community water related interventions. The next section throws some light on what underpins some of the occupational strategies and choices of households in the selected communities.

4.4 PERCEPTION OF WEALTH AND POVERTY [UNDERSTANDING WELL-BEING; AND LIVELIHOOD OUTCOMES]

This section presents the communities' conception of wealth and poverty and how that relates to people's quest to improve their well-being by expanding their assets base. The concepts and themes indicated in the section were distilled from the focus group discussions in the communities.

4.4.1. Communities' Concept of Wealth

Environmental decision making, financial and natural assets

In Abokobi-Pantang (peri-urban), Abelemkpe (high infrastructure provision) and Sabon Zongo (low infrastructure provision), the understanding of wealth within the peri-urban and urban setting includes both the material and non material aspects of human endeavour. According to the community discussions, wealth is demonstrated in the form of understanding about various aspects of life.

'Wealth shows in a person's understanding, way of doing things, cleanliness, neatness and how one carries himself/herself about' (mixed focus group, Abokobi-Pantang; young adults' focus group, Sabon Zongo).

This understanding should then lead to people making judgments that enable them to make the best out of engagements in society. The wealthy are therefore cautious in their decision making processes and the activities they engage in. The wealthy have sound (good) judgment such that it contributes to either their personal or socio-economic life. Such people offer counsel to those they interact with if necessary and they are also ready and willing to consider the counsel of others. Consequently they have peace of mind that enables them to make the best of their daily circumstances. In addition, and to sustain their life style and resources, the wealthy, also invest their time and resources appropriately. Therefore the wealthy are able to present acceptable and exemplary personalities.

They (wealthy) tend to be conscious of environmental cleanliness and hygiene. They are not expected to fall culprits to behaviour leading to pollution because they can afford the cost of solid and liquid waste disposal and have access to a hygienic toilet. This construct is summarised under the theme **results oriented personal and environmental decision making (theme)**.

A second theme, **financial assets**, was distilled from discussions in all the ten selected communities. Job/employment and income generating activities provide steady income to the household of the wealthy and because their activities are premised upon good decisions, they are able to apportion financial resources appropriately. The employment is either formal or informal and self employed or employed by someone else.

Another perceived reason for their success is that the wealthy are able to demonstrate a positive attitude towards their occupations and endeavours and therefore are able to make the best out of them. Their decision making processes in the job sector provides them an opportunity to make progress in their chosen occupation. The wealthy have good access to opportunities because they tend to be well positioned to take advantage of events. This enables them to be in a position where they are able to afford relevant household related expenditure [such as *water, sanitation, health care, education, clothing, and food*].

It was perceived by community members that because the wealthy are sufficiently prepared in terms of education and skill level, business start-up capital and dexterity in succeeding in endeavours, they are able to cross-over from one income group to the other and sustain it over a period; this is not so for the poor. As part of enhancing the capacity of households, the wealthy have the opportunity to develop their education and skills to give them a competitive edge in the job market. These views were expressed in the different focus group discussions, as in the following examples:

‘The wealthy live good, have no problem, enjoy three square meals a day, able to join when we are going ‘somewhere’, have livestock, own house and money’. ‘Owns property, lacks nothing, owns lands, waits for the crops to mature before harvesting, people listen to him or her’ (men’s focus group, Abokobi-Pantang).

‘[Wealthy people] take care of their children in school; they are all right, the poor go there to wash for them. [They], have managed/planned their lives very well such that [they] depend on no one’ (men’s focus group, supported by the young adults’ focus group, Abokobi-Pantang).

'He/she [the wealthy] is similar to a rich person, travels overseas several times, and has no needs' (mixed focus group, Kokomlele).

'The wealthy are able to cater for children's school fees, health care, and shelter. They are able to fulfil the needs of their children. They are able to save for the future' (young adults and men's focus groups, Kokomlele).

'The wealthy person has a job, owns a house, and has better facilities' (all four focus groups, Nima).

'The wealthy own cars, houses, and have good financial position'. 'They are able to offer good education to their children, and they are law abiding' (mixed focus group, supported by the young adults' and men's focus groups, Alajo).

'The wealthy are alright, possess houses, cars, employed. The children's appearance and family background also shows'. 'The wealthy are able to afford meals and whatever one needs. They are able to access good sanitation, do not think of tomorrow because they are sure of what to eat or how to meet needs. 'They do not worry about how to take care of their children' (all four focus groups, Abofu).

And finally, North Industrial Area:

'Wealth is manifested in property owned, dressing, own job, no needs, and own car' (men's focus group, North Industrial Area).

'The wealthy have money, not much problem, do not quarrel with people, and access clean water' (all four groups, North Industrial area).

Financial assets relate to the next theme: **natural assets** which were generated from the groups. This was discussed in Abokobi-Pantang where people have lands for farming, own livestock and have access to surface water for various activities; Dzorwulu where a few own livestock and Sabon Zongo where some own livestock and have farms outside the community, and North Industrial Area. The financial position of the wealthy offers them a unique opportunity to invest in land and livestock. These are resources that could be sold and exchanged with other forms of assets if necessary.

'The wealthy have houses, cows, farms, and production or a service company' (men's focus group, North Industrial Area).

Physical assets, behaviour and health

Financial assets also relate to **physical assets (theme)** which were distilled from all the different categories of selected communities: Abokobi-Pantang (peri-urban), Abelemkpe, Dzorwulu, Kokomlele (high infrastructure), Nima, Alajo (medium infrastructure), and Sabon Zongo (low infrastructure) because the issues of transport and housing are relevant to both the peri-urban and the urban communities.

Shelter is very important for both the wealthy and the poor. However, it is expected that the wealthy will either own houses or be able to afford the cost of rent without any difficulty because they have sound financial resources. The nature of the building (material used; that is high quality brick, cement block, or low quality brick), offers some indication of the wealth status of people. Ownership of a house also gives an indication of the wealth status of people.

‘Wealthy people live in [their] own house, feeding is not a problem, able to pay bills, have tap water and toilet in the house’ (all four focus groups, North Industrial Area).

In Abokobi-Pantang, Agbogba (peri-urban), Dzorwulu (high infrastructure provision), Nima, Alajo (medium infrastructure provision), North Industrial Area, and Sabon Zongo (low infrastructure provision), a theme recurring in discussions about the wealthy was **exemplary behaviour and public goodwill**. This theme relates to the importance of human interaction and feedback in society. In relation to environmental and personal cleanliness, the perception was that the wealthy tend to be conscious of their personal hygiene and cleanliness which is reflected in their behaviour to their surroundings. This helps to keep the environment clean, to the admiration of other community members.

Consequently, they attract the attention of community members and are accorded some level of recognition because of their exemplary behaviour. Their appearance is also noted to be welcoming and appropriate for an occasion. Therefore wealth, in the understanding of the community, is not just funds in a bank account but high quality behaviour of the household. In addition, they are considered law abiding and are seen as serving as a good example for other community members. Such people must be identified and involved as role models in demonstrating good practices and their results in relation to water and environmental pollution control (discussed in chapter five).

‘They [the wealthy] live in [a] conducive environment for good health; have good health, good sanitation, and good relationship with people’. ‘The wealthy are healthy, are free, can afford services, can access all sanitation facilities, have a car’ (all four groups, North Industrial Area).

The wealthy are perceived as building on this relationship through their community participation and enthusiasm for supporting community initiatives and individuals, in various aspects of life. They are seen as tending towards selflessness and as having the common good of the society in which they live at the core of their actions. They are said to think about the welfare of the city, community and the individual and are willing to

make contributions to respond to specific life challenges. This endears them to the community, to the extent that when they engage with people in the community, they are listened to and therefore they become important for considerations relating to water and environmental management:

'People listen to him or her' (men's focus group discussion, Abokobi-Pantang)

There are instances where the wealthy create opportunities and allow the poor to get on-board to raise some income for their household. This attitude of the wealthy endears them to the community and therefore accords them some degree of recognition.

'Wealthy people lack nothing; are rich, the children are alright. They are supportive; [they] set up companies to employ others' (women's and men's focus group, Agbogba).

'They help existing watchdog committees, (they) are healthy, and live in a clean environment with decent sanitation' (all four focus groups, Nima).

'The wealthy has everything, has no needs, lives in a clean environment, has good behaviour in the community, is neat, eats good food, has a job, invests his resources in what will bring progress, and is responsible' (young adults focus groups, North Industrial Area).

'The wealthy have everything and employ others' (men's focus group, North Industrial Area).

The theme of **health and mental status enabling productivity** was generated from discussions in Dzorwulu, Nima, and Alajo. A good health and mental state offers an individual the opportunity of peace of mind and space for reflective decision making. This theme embodies the emotional and the psychological status of the individual which enables people to feel well and relates to a stable mind. Such a mindset should allow for good decision making processes and also offers the opportunity for the individual to get engaged in an occupation or other income generating activity. The sound financial base enables them to keep their composure and enjoy stable mental and physical health making them more productive in their daily endeavour.

'The wealthy has good health, good personal hygiene and lives in a clean environment, enjoys three square meals, has good job, has cash, has car' (all four focus groups, Dzorwulu).

4.4.2 Communities' Conception of Poverty

Income generating opportunity and lack of financial assets

In the case of poverty, a recurring issue which emerged from the focus groups was *lack of job and income opportunity* defined by *access to jobs and other available income generating opportunities and working extra hours to make additional income (concepts/ideas)*. This arose from discussions in Abokobi-Pantang, Agbogba (all peri-urban), Abelemkpe, Dzorwulu, Kokomlemle (high infrastructure provision), Nima, Alajo (all medium infrastructure provision), and North Industrial Area (low infrastructure provision). Issues of jobs and income are relevant in all categories of the selected communities. The community perception (as discussed in the focus groups) was that the poor [in the community] struggle to secure employment or even set up their small businesses. Therefore the poor are compelled to depend significantly on local opportunities, if they decide to remain in the community.

This is one of the important factors trapping poor people in their state. Those who manage to have access to some opportunities are either exploited (by competition in the system), or their education and skill level do not allow them to rise to formal job positions. Some lack the capacity to negotiate for such occupations. This makes them unproductive in many endeavours. It is not uncommon to find the poor doing a combination of activities just to make sure the household is able to cover its basic needs. This is done with a lot of struggle. Some people may discriminate in the job type they want to do or are simply lazy and not willing to work. For some their human relations are affected to the extent that they are unfriendly to community members. Some demonstrations of this are given below.

'The poor lack jobs, have poor health status, have poor sanitation, big families, and struggle to educate their children' (mixed focus group, women's and men's focus groups, Nima).

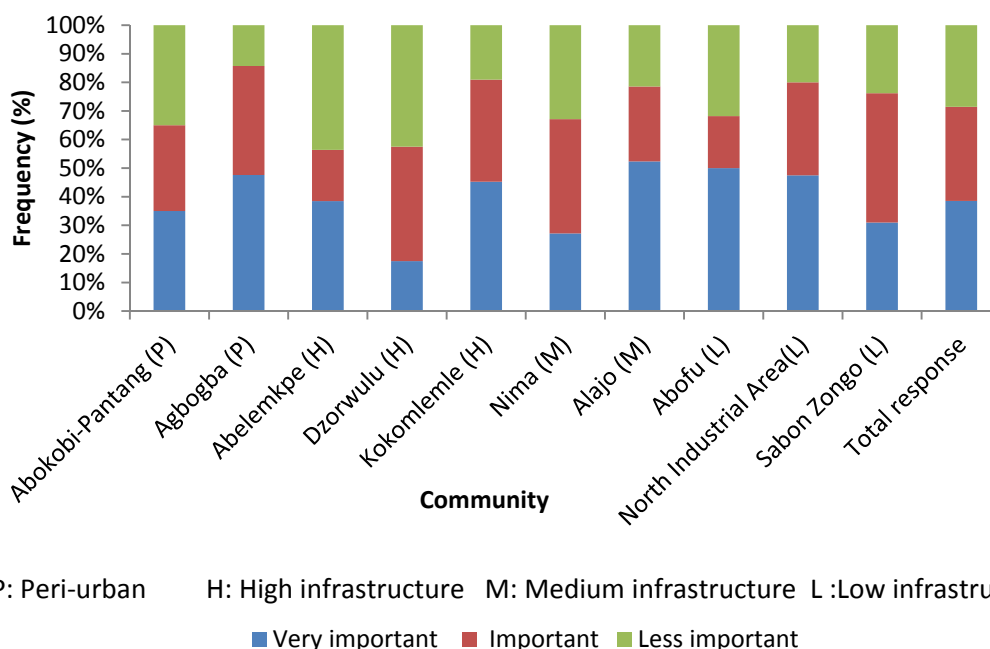
'The poor lack opportunity and access to job'. 'Many of the parents are in stark difficulty' (mixed focus group and men's focus group, Abofu.)

'Poverty is low income, starving because you want to save for your children'. 'Poverty is inability to afford rent and eating the wrong food' (women's focus group, Abofu)

'Poverty leads to crime, fraud, and drug use and peddling' (young adults' focus group, Abofu).

Figure 4.30 shows that over 50% of respondents indicated that lack of a job is either a very important, or an important indicator of poverty. Lack of a job as an indicator of poverty is explained above. Those who want to apply their entrepreneurial abilities find it difficult to raise the necessary capital to do so. The poor are known to struggle to access credit. The reflection of the above concepts in all the categories of the selected communities lends credence to the importance of job and income interaction within communities.

Figure 4.30: Lack of job as an indicator of poverty



[Table in Appendix 4.43]

Some of the poor are perceived to be lazy. This does not allow such people to make the best of their occupations and therefore continue to be trapped in low income occupations. *Lack of access to employment and other income generating opportunities* (concept/idea) has significant effect on the poor since they are not able then to sustain their income and expenditure flow. This is important in understanding many of the issues around poverty because of the possibility to convert financial resources to other forms of assets. Further detail on financial assets is presented below.

Lack of financial resources [financial assets](theme) was generated from discussions in all ten communities where people felt their financial positions were very discouraging. This theme, first of all is the reflection of the opposite of what was discussed under the presentation on wealth above. In this context, the poor are engaged

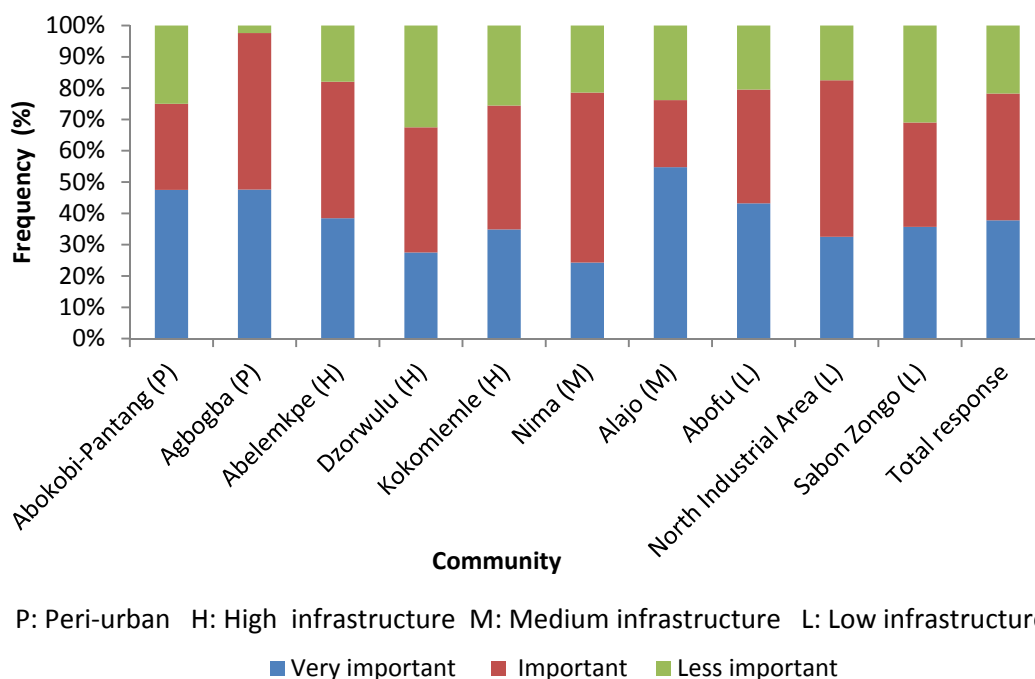
in less financially rewarding occupations or other income generating activities because of limited access to opportunities. The low financial resources pre-suppose that the poor will also find it difficult to invest into savings and other securities for the future.

Therefore occupational choices will be geared towards breaking out of the trappings of poverty and improving the income and expenditure flow of the household (in this case opportunities from water dependent occupations can be of immense support to households). However, they struggle to afford household related expenditure (such as food, water, clothing, sanitation, and health care) and therefore are unable to pay for goods and services at the household, community and city levels.

‘Poverty is inability to afford needs and wants; joblessness; inability to educate children’ (all four focus groups, Abokobi-Pantang).

Figure 4.31 shows that over 65 % of respondents indicated that inability to provide for household needs is either a very important or an important indicator of poverty.

Figure 4.31: Inability to provide for household needs as an indicator of poverty



[Table in Appendix 4.44]

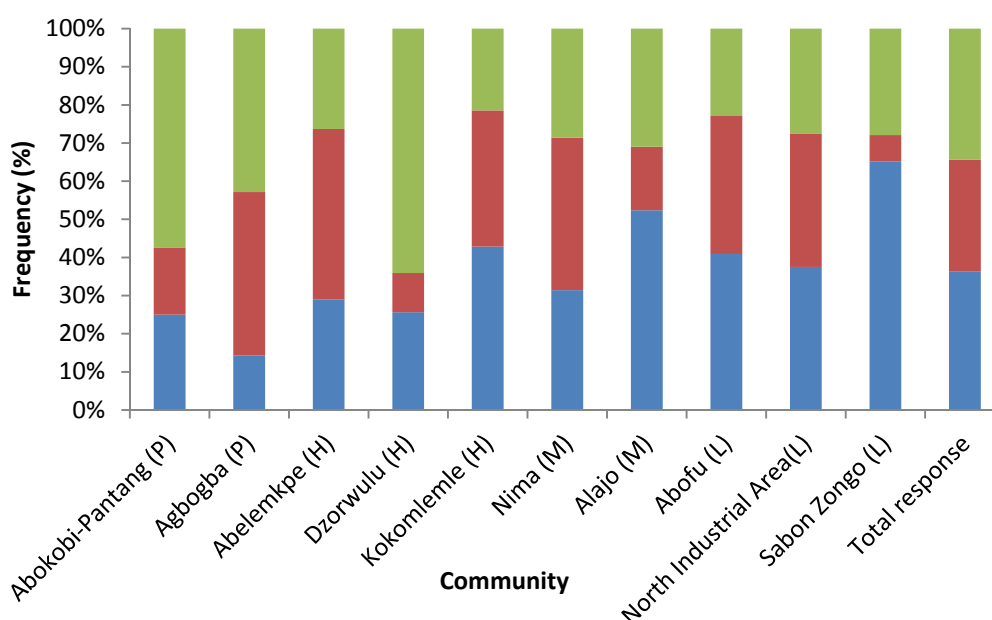
‘Poverty means that you have no money, no clothing, have nothing, cannot educate your children and cannot afford health care’ (women’s, men’s and young adults’ focus group).

‘A poor person has only few clothes, and often want to buy but has no money, so cannot afford, there is no job to obtain money to buy’ (mixed focus group, Kokomlemle).

‘Poverty is, not being able to have three square meals a day, children not schooling and [children] selling items to support the family (all four focus groups, Kokomlemle) (see also Figure 4.32).

Figure 4.32 indicates that over 50 % of respondents considered inability to afford three square meals a day as either a very important or an important indicator of poverty except Abokobi-Pantang (42.5 %) and Dzorwulu (35.8 %) where less than 50 % indicated similar opinion.

Figure 4.32: Inability to afford three square meals a day



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure

■ Very important ■ Important ■ Less important

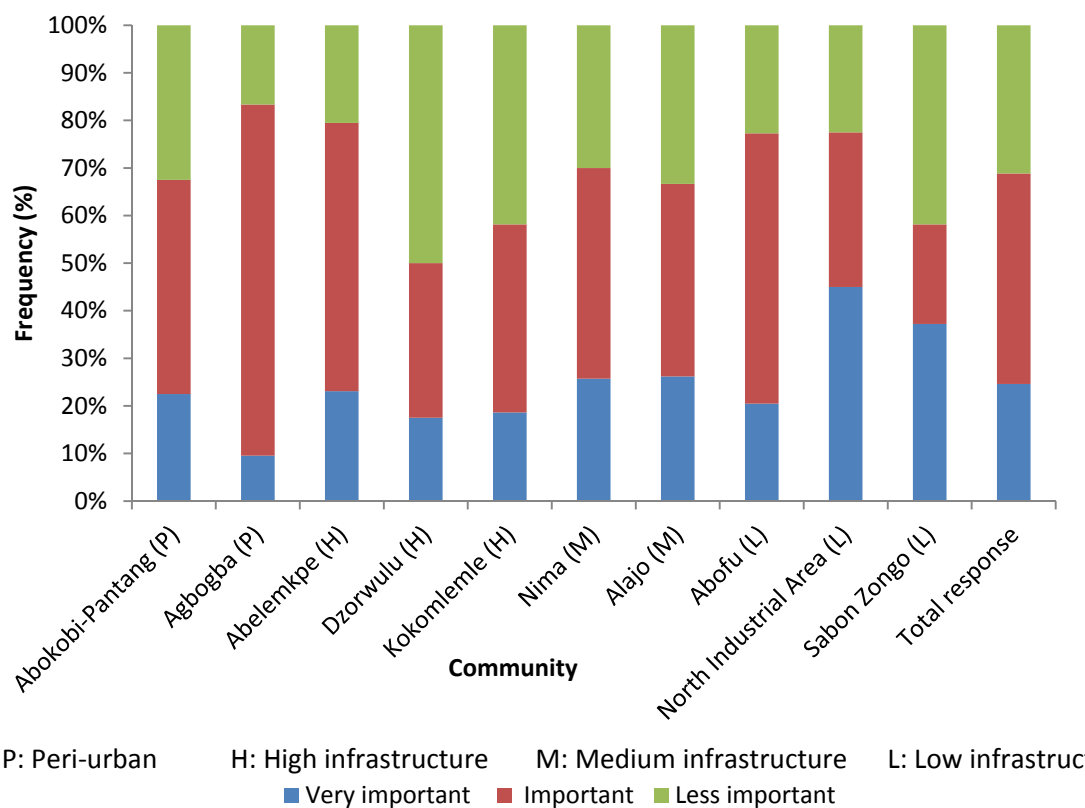
[Table in Appendix 4.45]

Some of those who considered inability to afford three square meals a day as a less important indicator of poverty were of the opinion that people can decide to eat less than three square meals a day and therefore not sufficient indicator of poverty (discussions in the field). However, the issue here is the ability to afford and not the frequency of meals in a day as households’ eating behaviour.

‘The poor queue to access the toilet, queue to bath, are unable to afford living cost, lack household items, disturbed by mosquitoes, are unable to afford school fees of children’ (all four focus groups, North Industrial Area).

Figures 4.33 and 4.34 present responses on ‘low level of access to water and sanitation’ and ‘inability to afford cost of water and sanitation’ as indicators of poverty. In all communities, over 60 % of the respondents indicated that low level of access to water and sanitation is either a very important or an important indicator of poverty except Dzorwulu, Kokomlemlle (slightly below 60%) and Sabon Zongo where less than 60 % of respondents indicated that low levels of access to water and sanitation is a very important or an important indicator of poverty. Abokobi-Pantang and the medium and low infrastructure communities have problems with access to water and sanitation.

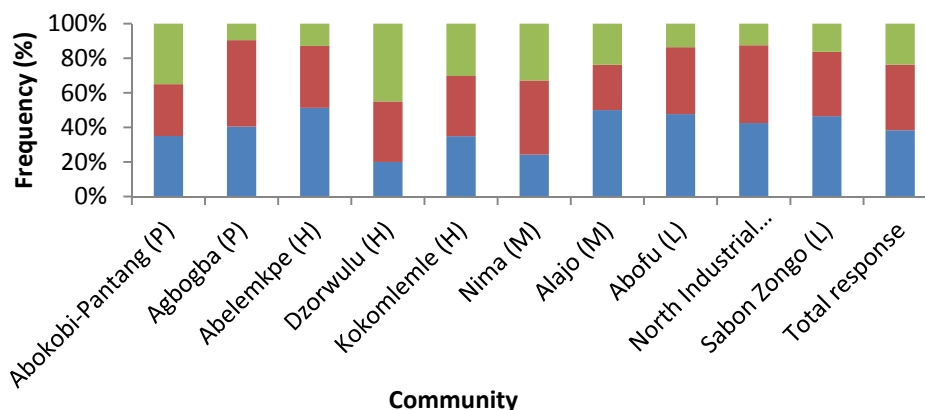
Figure 4.33: Low level of access to water and sanitation as an indicator of poverty



[Table in Appendix 4.46]

One of the elements of access is the ability of households to afford the cost of water and sanitation. Figure 4.34 indicates that over 60 % of respondents in all the communities except Dzorwulu (up to 55%) indicated that inability to afford the cost of water and sanitation is either a very important or an important indicator of poverty. This agrees with views expressed by participants in the focus group discussions.

Figure 4.34: Inability to afford cost of water and sanitation



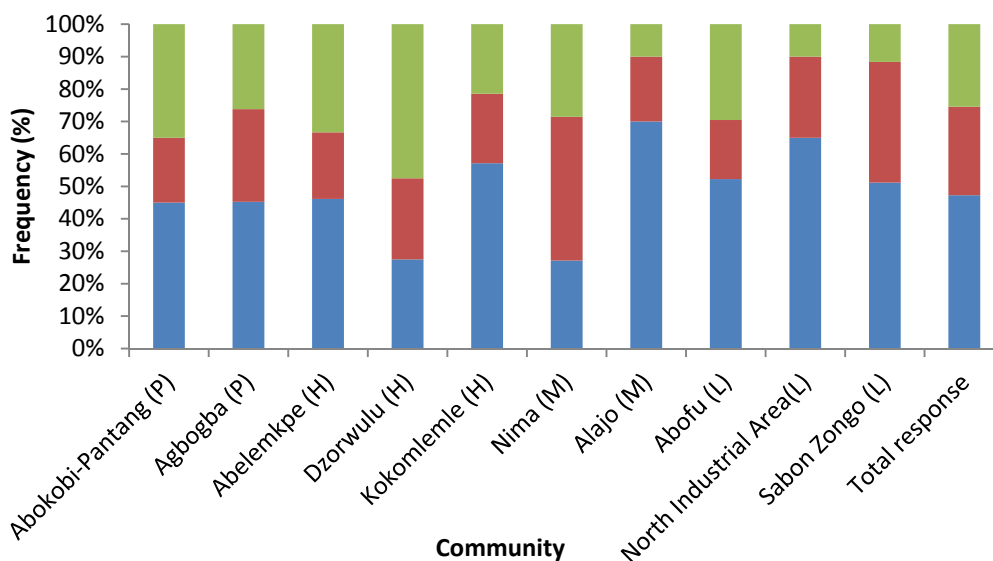
P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastr
 ■ Very important ■ Important ■ Less important

[Table in Appendix 4.47]

‘The poor are unable to meet basic needs, lack money, lack basic understanding to certain issues such as littering; struggle to cater for their households’. ‘The poor are needy, lack jobs, unable to afford meals, some are not neat, locked up in thoughts all the time, unable to afford decent shelter’ (all four focus groups, North Industrial Area).

Figure 4.35 shows that over 60 % of respondents in all the communities considered low financial resources as either a very important or an important indicator of poverty except Dzorwulu where up to 50 % considered it as either a very important or an important indicator of poverty. Nonetheless, in general, the responses on Figure 4.35 show that, respondents consider low financial resources as a very important or an important indicator of poverty. This is in agreement with what was discussed by the focus groups in the communities. This financial status may often be worsened by mismanagement of the little resources that they [poor] have, or a kind of over-exploitation of their resources [by competitors]. Mismanagement of resources and exploitation traps people in poverty.

Figure 4.35: Low financial status as an indicator of poverty



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure

■ Very important ■ Important ■ Less important

[Table in Appendix 4.48]

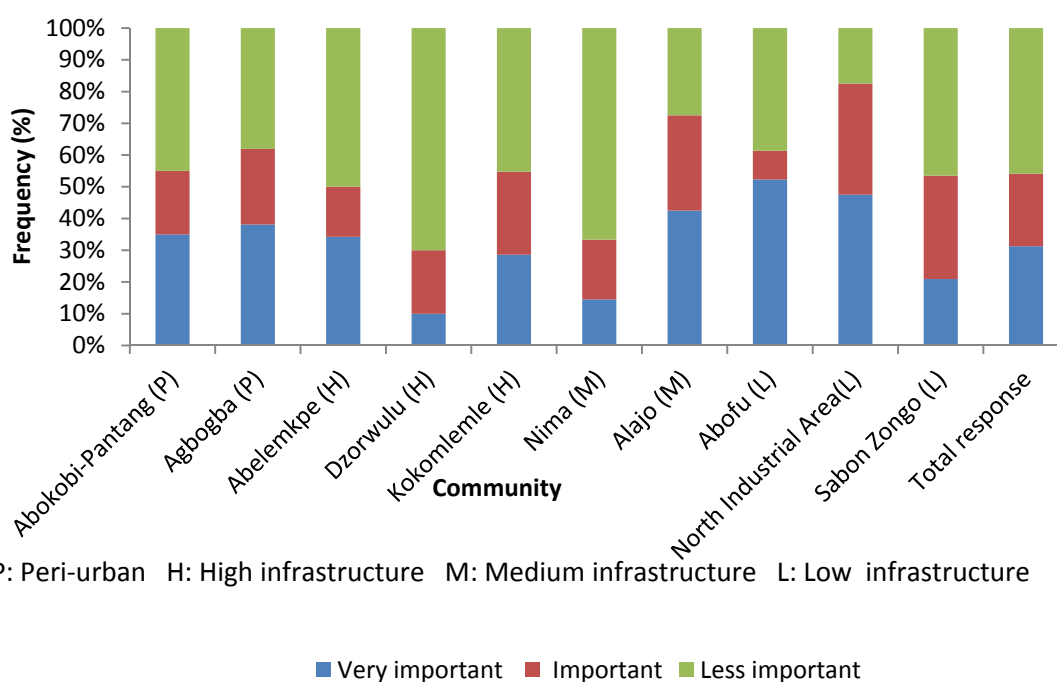
Rising cost of living is also trapping the poor in poverty and therefore many are coping by adopting various measures. Poverty subjects the household to difficult and challenging periods and therefore if the household heads do not make efforts to assuage the consequences of their conditions it will become difficult for the household to invest in other forms of assets.

This obviously compels the poor to make a lot of sacrifices, for example by reducing the frequency and the quality of food. This is believed will enable the household shift budgets within the income and expenditure flow. In the worst case scenario, some households may have to seasonally or occasionally beg or rely on family and friends for support in order to get basic items such as food. Therefore, if there are children in the household, they are compelled to engage in small business activities to support the household income flow. Due to the extended family system in Accra (Appendix 4.49) and Ghana (Ghana Statistical Service, 2002), certain forms of socio-economic support may be extended to households living in poverty by family and friends. The prudent ones manage the little resources they have carefully, while others may indulge in social vices.

Physical assets and anti-social behaviour

Other challenges coming from the inability to cater for household needs are reflected in discussions of **physical assets (theme)**. This was particularly the case in Abokobi-Pantang, Agbogba (peri-urban), Dzorwulu (high infrastructure provision), Nima, Alajo (medium infrastructure provision), Abofu, North Industrial Area, and Sabon Zongo (low infrastructure provision), and relates to the struggles households engage in to procure shelter, the type of material used in the construction, some of which may be made of local earth bricks, and houses which have to be renovated, especially in Abokobi-Pantang. In Agbogba, if the house is located at a place where there is *low access to social amenities*, then it becomes more problematic. Figure 4.36 shows that 50 % or more of the respondents in all the communities indicated that lack of ownership of physical assets is either a very important or an important indicator of poverty except Dzorwulu (30%) and Nima (33.2 %).

Figure 4.36: Lack of ownership of physical assets as an indicator of poverty



[Table in Appendix 4.50]

Emerging from discussions in Agbogba (peri-urban), Abelemkpe, Dzorwulu, Kokomlemle (high infrastructure provision), Abofu, and North Industrial Area (low infrastructure), was the theme: **anti-social and unproductive attitudes and behaviours**. According to informants, the poor often suffer from ‘poverty of decision

making' and this could trap them in poverty for a long time. Decisions and choices for the household often do not bring the best to them, possibly due to the lack of capacity to take the decisions that are likely to engender progress and development. Therefore their personal demeanour, appearance and environment demonstrate low living standards.

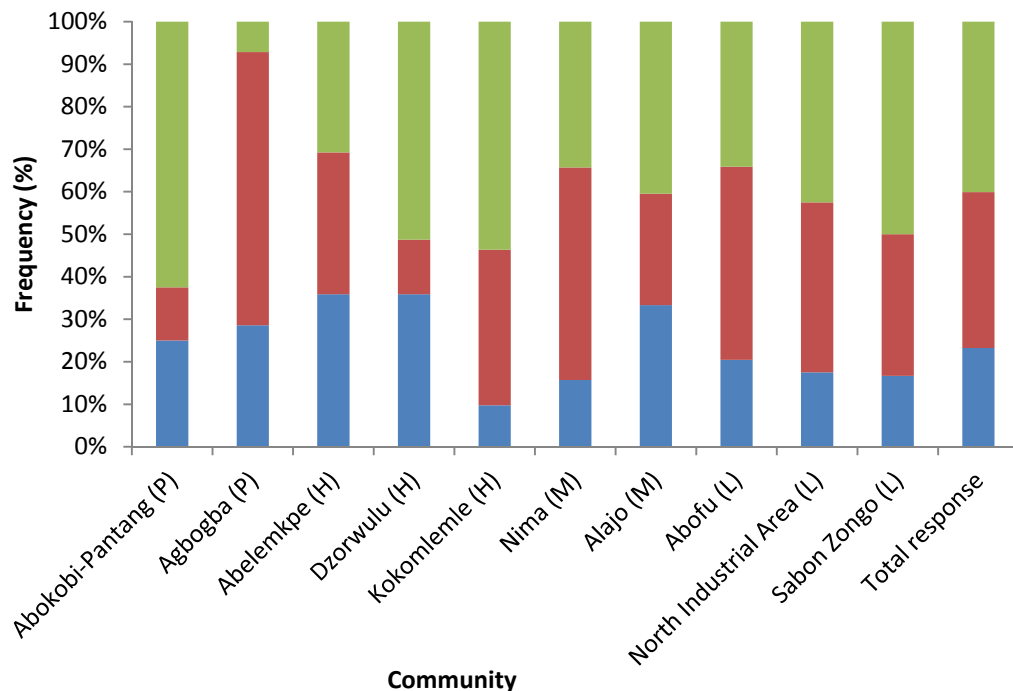
In addition, community perceptions were that they [poor] tend to be culprits and victims of pollution at the same time, because often they live in communities with low environmental quality standards. Communities also perceived that some tend to be irresponsible in many aspects of life such that they are not able to make the best of daily situations and experiences. In the view of informants, because of the general irresponsibility by some (the poor), they are often caught up in behaviour which does not promote personal and environmental cleanliness.

According to local perceptions, some members of the household are drawn into *recklessness and indulgence in crime /engaging in social vices such as prostitution, armed robbery, stealing and alcoholism (concepts/ideas)*. Some are trapped in other forms of social vices such as substance abuse, or drug use and peddling, teenage pregnancy, and general lawlessness among others.

'The poor [person] has a bad appearance, has no job, is quarrelsome, and has poor relationships with others' (Young adults, North Industrial Area).

In the peri-urban areas, up to 38 % of respondents in Abokobi-Pantang indicated that social vices are either a very important or an important indicator of poverty (Figure 4.37). During the discussions at Abokobi-Pantang, social vices did not come up as activities people have observed the poor in or outside the community engage in. Perhaps this might have influenced community responses. At Agbogba, there was overwhelming (92.4 %) agreement from respondents that social vices is an indicator of poverty. A little below 50 % of respondents in Dzorwulu indicated that social vices are either a very important or an important indicator of poverty.

Figure 4.37: Social vices as an indicator of poverty



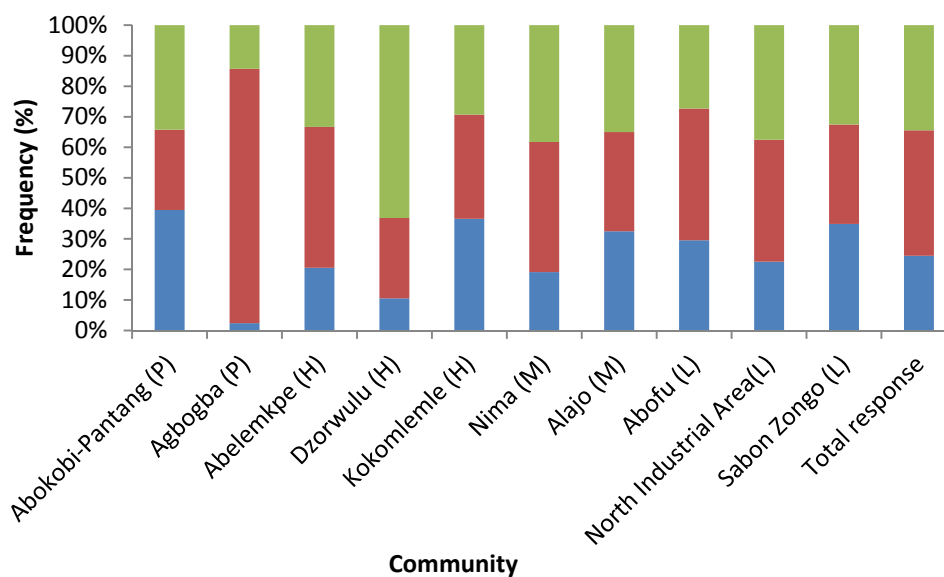
P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure
 ■ Very important ■ Important ■ Less important

[Table in Appendix 4.51]

Over 50 % of respondents in the remaining communities in high, medium, and low infrastructure provision indicated that social vices are either very important or important indicators of poverty. Social vices were also highlighted in discussions in Nima, Alajo, Abofu, Sabon Zongo, as problems within the communities. Informants’ perceptions were that the poor indulge in social vices ostensibly to raise income but end up destroying their lives. This could bring psychological problems disturbing the *mental state* of household members. Others, such as lack of commitment to an occupation may trap people in poverty. Further explanation of the situation of the poor expressed in the discussion groups, is that, often poor health may characterize the life of some poor people such that they are unable to get the best out of their life.

Over 60% of respondents in all the communities indicated that poor health status is either a very important or an important indicator of poverty except Dzorwulu where up to 36.8 % of respondents indicated that poor health status is either a very important or an important indicator of poverty (Figure 4.38). The poor are known to suffer from poor health and *mental state* for which reasons they tend to be unproductive, as reflected in discussions in the above communities.

Figure 4.38: Poor health status as an indicator of poverty



P: Peri-urban H: High infrastructure M: Medium infrastructure Low: Low infrastr

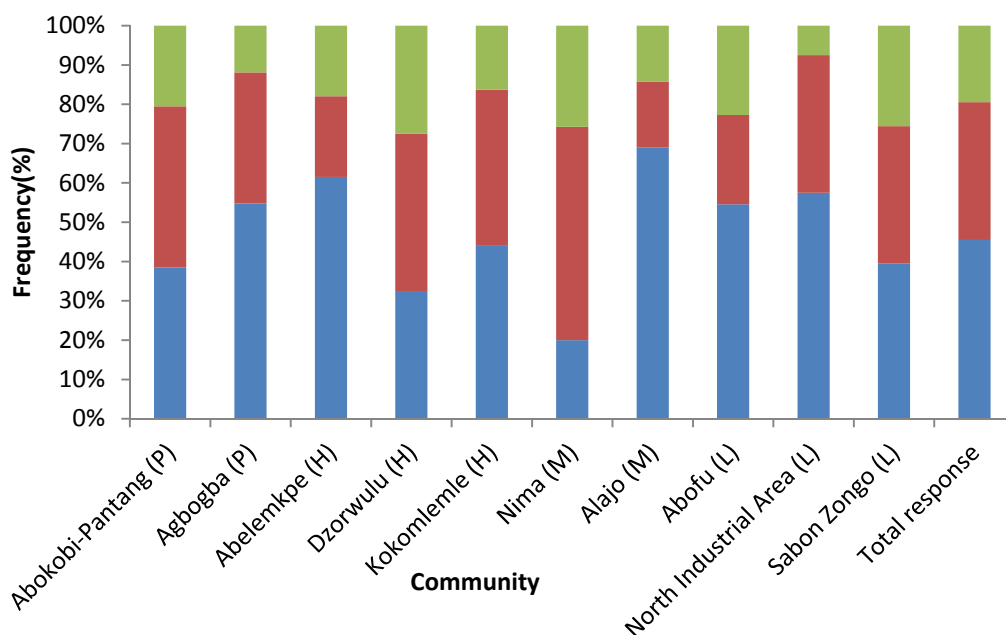
■ Very important ■ Important

[Table in Appendix 4.52]

This poor health may have come from various sources, but may include inability to afford health care and the degree of stress and psychological challenges encountered over financial issues. The burden of the inability to afford basic needs of households can be a drain on the *mental state* of the poor which could affect their health eventually.

Over 70 % of respondents in all the communities indicated that poor mental state (such as worries, too much thinking about how to provide for self and household) is either a very important or an important indicator of poverty, except Dzorwulu where up to 62.5 % indicated that poor mental state is either a very important or an important indicator of poverty (Figure 4.39).

Figure 4.39: Poor mental state as an indicator of poverty



P: Peri-urban H: High infrastructure M: Medium infrastructure L : Low infrastructure

■ Very important ■ Important ■ Less important

[Table in Appendix 4.53]

Capacity development

In discussions at Abokobi-Pantang, Dzorwulu, Kokomlemle, and North Industrial Area, it was indicated that the low levels of *education and skill development* (concept/idea) of the poor constrain them from accessing opportunities available for people with high education and skill levels. Thus one way of addressing this type of poverty is to enhance education and skill levels. This would also improve the financial base of the household, since a rewarding occupation is one way that improves the income situation.

Discussion groups in Kokomlemle, Alajo, and North Industrial Area identified *lack of parental (or family) and non-family member support (including friends)* (concept/idea) as important factors influencing the situation of the poor. The influence and the support of parents to youth and young adults are important. The challenge remains however, that poor households struggle to offer the necessary support needed for the progress of its members.

The poor are therefore compelled by circumstances to depend on families and friends for support. The poor face challenges of inadequate *parental and non family member*

support; sometimes worse for young people living with step parents where they may not be treated fairly. In some cases, people have been trapped in poverty because they were denied their legitimate inheritance. Lack of support from household and from non family members contributes to the inability of the poor to acquire enough education and skills to secure them employment in the formal sector or improve their efficiency in the informal sector.

'Poverty is lack of opportunity, irresponsibility of parents to take care of their children, poorly spaced birth, and poor family background' (men's focus group, North Industrial Area).

Environmental pollution control

Discussion groups in the communities of Nima, Alajo (medium infrastructure provision), and North Industrial Area, identified problems of **lack of environmental pollution control and lack of environmental and personal cleanliness (theme)**. When people are not stable mentally [worry about livelihoods] it could reflect in their lack of regard for environmental and personal cleanliness. Therefore the poor are perceived as being more likely to break environmental and sanitation laws.

'The poor are unable to pay school fees and water bills'; cannot get funds to buy food; unable to pay for sanitation services'. 'They are unable to pay for water and lack peace in the home' (All four focus groups, Alajo).

The concept of the *influence of urbanization and the nature of the community (in terms of infrastructure provision: roads, solid waste collection, sanitation, type of materials used for buildings, social amenities)* was distilled from focus groups in Abofu. In the opinion of informants it is possible to identify localities in the city where the majority of the people can be considered as poor. Though urbanisation creates opportunity to attract people into the city, soon the level of competition for resources and opportunities in the city makes the poor unable to access their basic needs. Consequently, the poor are financially distressed most of the time, making it difficult for them to afford household related expenditure (such as water, sanitation, food, clothing, among others). This is where small-scale occupations in water businesses offer a lot of hope for poor people because very little capital is required under such circumstances.

The above discussion on poverty demonstrates how perception of wealth and poverty is constructed around asset ownership. Therefore the next section presents and draws linkages between households' assets ownership and distribution of wealth and poverty

in the city. It is anticipated that this will enhance the understanding of urban and peri-urban poverty in the city.

4.4.3 Socio-economic Scores Computed from Household Assets [using Principal Component Analysis] [PCA]

The PCA was carried out to allow comparison of the socio-economic status of households across the different communities and to enhance understanding of communities' livelihoods and opportunities. The PCA is a statistical method for generating weights for a set of variables that are correlated. It allows the data on a large number of variables (all the various household assets) to be reduced to a smaller number of principal components or weights that account for most of the variation in the observed variables. These weights are then used for further calculations to generate dependent variables for the data and subsequent interpretation.

The underlying principle of PCA is that households with high wealth status will have more of a combination of these relevant assets for their specific situations. Therefore the wealthy should have more of the relevant assets. The asset weights are generated from the input data comprising ownership of social, human, physical, natural, and financial assets. The weights are generated by comparison of the distribution or frequency of the assets in the sample. Assets which help to differentiate between the wealth status of households are assigned a higher weight. Assets which help little to differentiate between households are assigned a lower weight by the PCA.

The socio-economic scores calculated from the weights are a summation of the weights of all the assets owned by the household (called socio-economic score). Therefore households that are wealthy in a particular wealth construct will have a higher socio-economic score and therefore a higher socio-economic status. The detailed approach to the PCA has been presented in chapter three - the methodology (see chapter 3.2.2.1 on how the PCA was used).

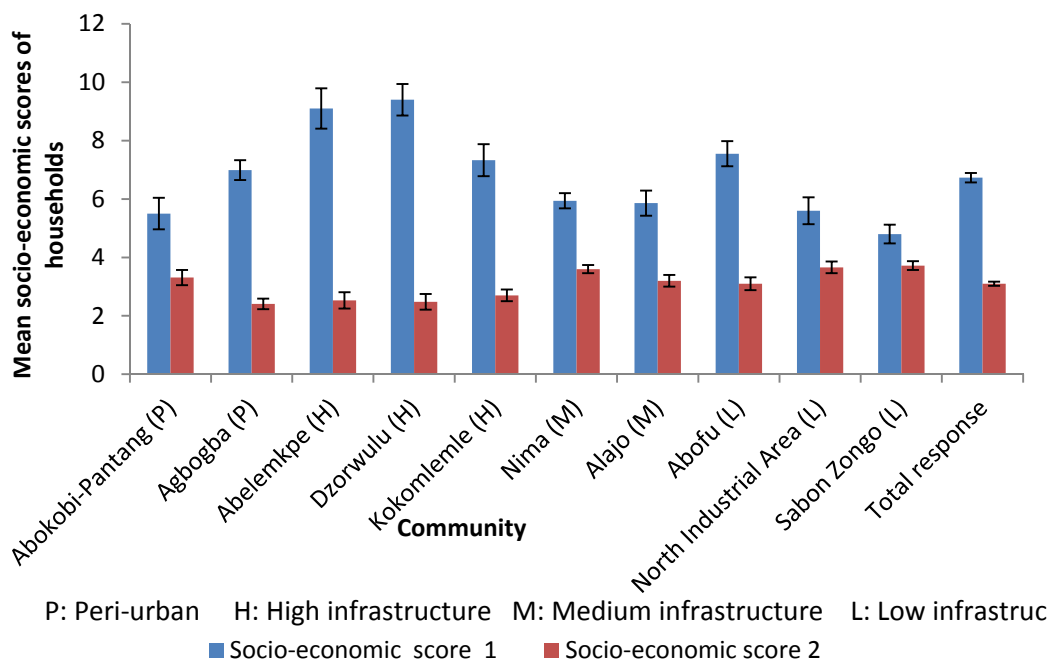
The PCA produced two different sets of weights (Appendix 4.54) to account for the differences in wealth status between households. The first set of weights (Appendix 4.54) indicates that physical assets, occupational associations, financial assets, presence of tap water, medium and high levels of education and formal employment are the

parameters which contribute most to wealth differences between households. The first set of weights are used to compute socio-economic score 1 for each household.

The ‘remaining’ differences in wealth between the households are accounted for by the second set of weights (uncorrelated with the first set) which are used to compute socio-economic score 2 for each household. The second set of weights indicates that other physical assets - bicycle, motor bike, and livestock [more important in the second set of weights than the first], political leadership, use of public toilets, informal employment, and low educational level are the parameters which contribute most to the ‘remaining’ wealth differences between households. Mean socio-economic scores for 1 and 2 are computed for each community (Figure 4.40); the higher the mean socio-economic score, the higher the socio-economic status or wealth status of the households.

The PCA identified two aspects of socio-economic status clustering (or wealth clustering) operating at the household level since every household had a score for both socio-economic status 1 and 2. The first score relates to socio-economic status of households as measured by more formal employment and high ownership of physical, financial and human assets, whereas the second score relates to the socio-economic status of household to the extent that they benefit from a more fluid and flexible access to informal income generating activities with little ownership of particular physical assets. Thus it is observed that households scoring high on socio-economic score 1, scored low on socio-economic score 2 and vice versa, as shown, for example, in the communities with high infrastructure provision, (Figure 4.40).

Figure 4.40: Socio-economic scores of households in the communities



[Table in Appendix 4.55].

4.4.3.1 Discussion of socio-economic score 1 at the community level

The brief in this sub-section compares the socio-economic scores between the communities. This is to help throw further light on the socio-economic status of the households. Comparing the **peri-urban communities with other communities**, the mean socio-economic score 1 of households at Agbogba (6.99 ± 0.34) was statistically significantly higher than at Abokobi-Pantang (5.5 ± 0.34) ($P < 0.05$). It was also significantly higher than in the North Industrial Area (5.58 ± 0.48) and Sabon Zongo (4.82 ± 0.32) ($P < 0.05$) (Appendix 4.56). This implies that in terms of assets ownership [used for the analysis], the households in Agbogba were ahead. This is also consistent with the mean household income observed for the above mentioned communities (Figure 4.19).

In the **high infrastructure provision communities**, the mean socio-economic score 1 at Abelemkpe (9.1 ± 0.69) and Dzorwulu (9.4 ± 0.54) were statistically significantly higher than at Kokomlemle (7.33 ± 0.55); and also higher than at Abokobi-Pantang, Agbogba, Nima, Alajo, Abofu, North Industrial Area, and Sabon Zongo [that is all other communities] ($P < 0.05$) (Appendix 4.56). This is also consistent with the household incomes (Figure 4.19) and the mean per capita monthly household incomes (Table 4.6) observed for Abelemkpe and Dzorwulu. The mean socio-economic score 1 at

Kokomlemle [high infrastructure provision] was significantly higher than at Abokobi-Pantang, Nima, Alajo, North Industrial Area, and Sabon Zongo ($P < 0.05$) (Appendix 4.56). This is consistent with the mean per capita household income (Table 4.6) which projected Kokomlemle as better off than the mean monthly income projected it to be. However it is inconsistent with the mean total monthly household income (Figure 4.19) since it was slightly lower than the mean monthly income at Nima and Alajo [both of medium infrastructure provision] but not significant.

For the **medium and low infrastructure communities**, the mean socio-economic score 1 at Abofu (7.5 ± 0.43) was statistically significantly higher than at Nima (5.94 ± 0.26) and Alajo (5.86 ± 0.43). It was also significantly higher than at Abokobi-Pantang, North Industrial Area and Sabon Zongo ($P < 0.05$) (Appendix 4.56). This is also consistent with the mean household income for Abofu (Figure 4.20) but inconsistent with the mean monthly *per capita* household income which depicted Abofu as worse off than the income levels projects it to be (Table 4.6).

4.4.3.2 Discussion on socio-economic score 2

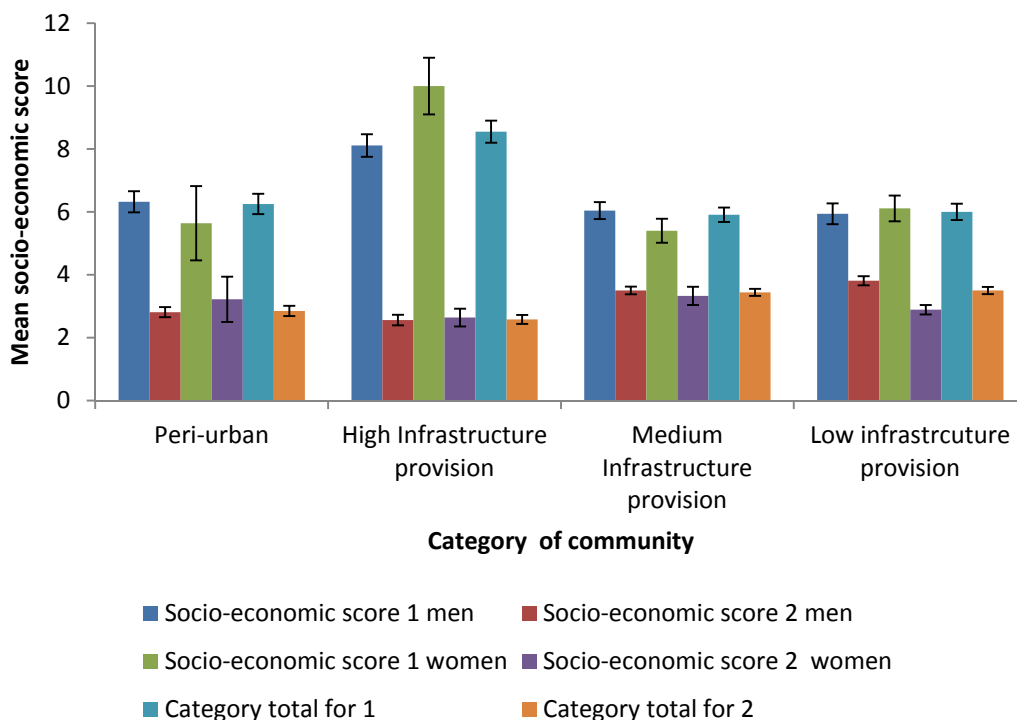
In the **peri-urban and low infrastructure communities**, the mean socio-economic score 2 at Abokobi-Pantang (3.3 ± 0.26) and North Industrial Area (3.66 ± 0.2) were significantly higher than at Agbogba (2.41 ± 0.18), Abelemkpe (2.58 ± 0.23), Dzorwulu (2.5 ± 0.27) and Kokomlemle (2.71 ± 0.2) ($P < 0.05$) (Appendix 4.56). The mean socio-economic score 2 at Abofu (3.1 ± 0.22) was significantly higher than at Agbogba and Dzorwulu ($P < 0.05$) (Appendix 4.56). Since Abofu had a low mean per capita monthly income, this is consistent.

In the **medium infrastructure communities**, the mean socio-economic score 2 at Nima (3.6 ± 0.14) and Sabon Zongo (3.72 ± 0.15) were significantly higher than at Agbogba, Abelemkpe, Dzorwulu, Kokomlemle, and Abofu ($P < 0.05$) (Appendix 4.56). This is consistent with the fact that both Nima and Sabon Zongo scored lower socio-economic score 1. Furthermore, the mean socio-economic score 2 at Alajo (3.15 ± 0.19) was significantly higher than at Agbogba, Abelemkpe and Dzorwulu ($P < 0.05$) (Appendix 4.56). This is consistent with the fact that, Alajo recorded a lower socio-economic score 1 (Figure 4.40).

4.4.3.3 Differences between communities by gender of household head

In relation to **socio-economic score 1**, male headed households scored higher in peri-urban and in communities with medium infrastructure provision with virtually no difference between male and female headed households in the communities with low infrastructure provision (Figure 4.41).

Figure 4.41: Mean socio-economic score by gender of household head and category of communities



[Table in Appendix 4.57].

Female headed households scored significantly higher than male headed households in the communities with high infrastructure provision ($P < 0.05$) (Appendix 4.57). This is not consistent with the mean total monthly household income of the female headed households or the mean per capita monthly household income for the female headed households. Since both were lower than the male headed household (Tables 4.5 and 4.7).

In relation to **socio-economic score 2**, male headed households scored higher in communities with medium and low infrastructure provision (significantly higher in the latter, Figure 4.41, ($P < 0.05$)) (Appendix 4.57). Female headed households scored higher

in peri-urban and communities with high infrastructure provision. However, these differences were not significant ($P>0.05$) (Appendix 4.57).

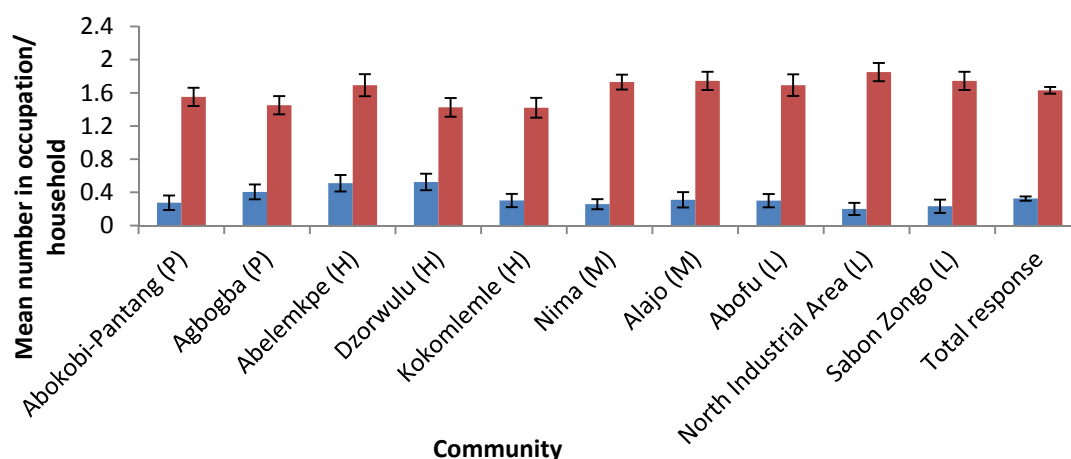
In general, in terms of urban and peri-urban assets, apart from the communities with high infrastructure provision (in relation to socio-economic score 1; where female headed households were better off) and communities with low infrastructure provision (in relation to socio-economic score 2; where male headed households were better off), the evidence in the study did not indicate female headed households being significantly worse off than male headed households.

To explain the above further, it would suffice to say that households in the communities with high infrastructure provision tend to be favoured by a more settled job with comparatively reduced reliance on informal opportunities as compared to the communities with medium to low infrastructure provision (Figure 4.42). Thus households with high infrastructure provision score high on socio-economic score 1. The flexibility of jobs [high degree of informality] [Figure 4.42 below] may possibly open the communities with medium to low infrastructure provision to additional socio-economic resources and opportunities which may not be available to the communities with high infrastructure provision.

4.4.4 Access to Formal and Informal Occupations in the Communities

To help explain the element of informality which was particularly prominent in the calculation of socio-economic score 2, analysis of participation in formal and informal occupations by households was also carried out. The results are presented below.

Figure 4.42: Mean number of people in formal and informal occupations per household in the communities



P: Peri-urban H: High infrastructure M: Medium infrastructure L: Low infrastructure
 ■ Formal occupation ■ Informal occupation

[Table in Appendix 4.58].

4.4.4.1 Formal occupations

In the **high infrastructure communities**, the mean number of formal occupations per household in Dzorwulu (0.53 ± 0.1) (Figure 4.42) was significantly higher than at Abokobi-Pantang (0.275 ± 0.09), Nima (0.26 ± 0.06), North Industrial Area ($0.2 + 0.07$), and Sabon Zongo ($0.23 + 0.08$) ($P < 0.05$) (Appendix 4.59). This is consistent with the underlying assumption (and also from the PCA analysis) that communities with high number of people in the formal work sector tend to score high on socio-economic score 1.

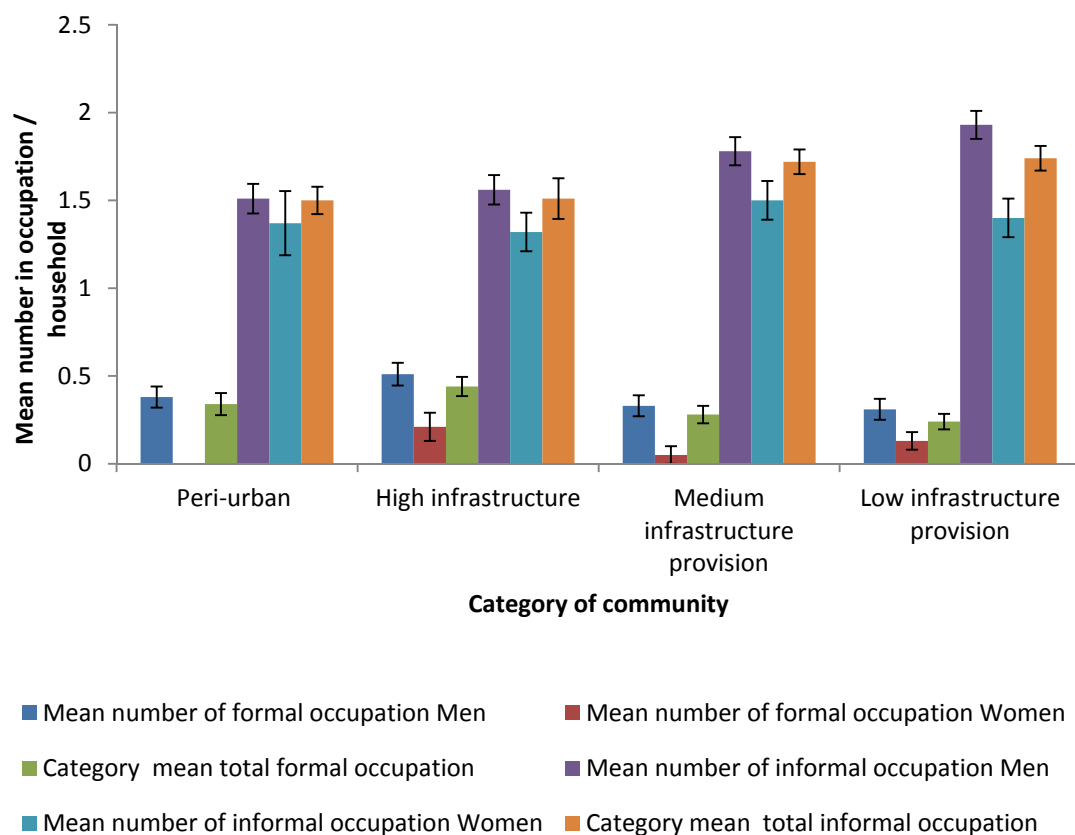
The mean number of formal occupations per household in Abelemkpe (0.51 ± 0.1) was significantly higher than at Nima, North Industrial Area, and Sabon Zongo ($P < 0.05$) (Appendix 4.59). Since both Dzorwulu and Abelemkpe are within the high infrastructure provision communities, it is as expected. The fact remains that household socio-economic status is contributed to by formal employment in all cases, but its contribution becomes more important in the communities with high access to infrastructure provision (Figures 4.41 and 4.42).

4.4.4.2 Informal occupations

In the **medium infrastructure provision communities**, the mean total number of informal occupations in Nima (1.73 ± 0.09) was significantly higher than at Dzorwulu

(1.43 ± 0.11) and Kokomlemle (1.42 ± 0.11). In the **low infrastructure provision communities**, the mean total number of informal occupations per household at North Industrial Area (1.85 ± 0.11) was significantly higher than at Agbogba (1.45 ± 0.11), Dzorwulu and Kokomlemle ($P < 0.05$) (Appendix 4. 59). The mean total number of informal occupations per household in Sabon Zongo (1.74 ± 0.11) was significantly higher than at Kokomlemle.

Figure 4.43: Mean number of total formal and informal occupations per household by gender of household head



[Table in Appendix 4.60].

Though informal occupations are important in all categories of communities, they are more important in the communities with medium and low infrastructure provision (Figures 4.42 and 4.43).

The mean total formal occupations of male headed households of high, medium, and low infrastructure provision communities were significantly higher than those of female headed households (Figure 4.44) ($P < 0.05$) (Appendix 4.60).

4.5 SUMMARY

This chapter has addressed research question one: How does access to water for domestic and productive uses affect households and their well-being? The findings are summarised by the sub-research questions. In relation to sub-research question 1(i): What factors influence access to water by households? The study found that access to water by households in the various communities largely depends on the availability of water supply lines and therefore, although the community may have the capacity to afford the cost of connection, they may be denied it because of lack of supply lines such as in Agbogba and Abelemkpe. However, there are obvious cases of lack of capacity to afford a connection even when supply lines are available; for example it is not every household in Nima, Alajo or Sabon zongo that could afford the cost of tap water supply connection. Slow or failed responses to faults on pipelines have resulted in the current challenge of lack of flow to some houses. Therefore many households depend on their neighbours and other sources for water supply. This is related to the organizational culture of the GWCL where it does not appear that much emphasis is placed on pipe line maintenance.

For sub-research question 1(ii): How is water use affecting households, including income from water dependent occupations? It was found that communities with high infrastructure provision are likely to also have high levels of income, barring any exceptions which can be explained with other data. Male headed households are more likely to have a higher household income as compared to female headed households due to access to additional opportunities available to men. Income also tends to be appreciable in communities such as Nima, Alajo and Sabon Zongo, where households are involved in local economic or commercial activities. That is why household incomes in the medium and low infrastructure provision communities are not as low as might be expected, compared to the high infrastructure provision communities. Male and female headed households in communities with high infrastructure provision tend to have access to more stable jobs requiring specific skills (although lower in female headed households than in male headed households).

The evidence from the study did not show either male or female headed households receiving a significantly higher income from water dependent occupation; rather they were more or less benefiting equally. The contribution of water dependent occupations to total monthly household income is more important as one moves from the peri-urban

to communities with high, medium, and low infrastructure provision (in terms of the diversity of the occupations and the margin of percentage monthly profits).

There is high demand for the products and services of water dependent occupations. The water dependent occupation is profitable in all the categories of communities. Therefore households with the capacity to invest more, gain more profits if the product has a standard price across the city as observed in Abelemkpe and Dzorwulu [in the sale of sachet water]. Though there was no significant correlation between the amount of money invested and the profits made, the evidence shows that water dependent occupations are in general profitable. Household incomes come from different sources including water dependent and non-water dependent occupations. Thus, household members may not live where they work.

Findings for sub-research question 1(iv): what are the existing social relations or networks and how do they influence households and occupations? The investigation indicated that parents feel obliged to ensure that their older children and dependents are able to access opportunities available to become the best that they can in their endeavours. The strong family ties between parents and their children play a role in some older children doing similar occupations as their parents. The evidence from the study indicates that older children, youth, and the young adults are equally under the influence of external factors when it comes to their choice of occupations (see section 4.3.1) and therefore it is of essence that parents understand the mechanism and the nature of this influence.

In some communities, people recognize common concerns and express a desire to find common solutions to these by proposing to come together in the form of informal associations - if not to respond to particular challenges, then to achieve a certain end. They may be bound by defined rules of association or operate in a flexible manner (see section 4.3.3).

The sub-research questions 1(v): What are the communities' perception of wealth and poverty? Do they encompass access to water? and 1(iii): what is the asset status of households? were answered as follows. Usually wealthy people are able to afford basic sanitation which makes it possible for them to manage sanitation and waste in their houses. This tends to make them stand out in their respective communities. The

community members, observing their attitudes consider them as having different attitudes than others who pollute the environment. People share the opinion that wealthy people tend to demonstrate respect towards their neighbours. They are noted to desire the common good of other people. They are therefore considered as agents of change.

The discussions did not identify any perceptions relating to negative attitudes and behaviour of the wealthy. In contrast, wealth achievement has components of both individual and collective effort. Since the wealthy are perceived to listen to the counsel of others, their progress can be influenced by their interaction with the people in their communities. The role of jobs and other employment in the achievement of wealth implies that market factors can affect it. The wealthy can create opportunities or take advantage of available opportunities in the society. Investments in natural capital such as lands depend on the prevailing market conditions and security of purchase defined by the existing legal framework.

Poverty is perceived as being related to limited access to income generating opportunities because of low capacity to access both the formal and informal sectors. Low capacity may be as a result of low access to skills development opportunities or the inability to negotiate for access and opportunities. Therefore, the financial resources tend to be low, resulting in low levels of other assets of wealth. Therefore the poor are unable to invest in their future.

In general, income levels and mean socio-economic score 1 of households in the communities were consistent with their mean per capita household income, with the exception of Kokomlemle and Abofu. Socio-economic score 2 appears to be a compensatory 'wealth status' for households recording low values on socio-economic status 1. Households doing poorly on the more formal type of wealth can do well on the more informal type of wealth. Wealth status encompasses access to water since access to water was mentioned by focus group participants as differentiating between the poor and the rich and was also included in the list of indicators for the determination of household wealth status.

In terms of vulnerability of households to social, economic, water, environmental and other factors, the lack of pipelines in houses results in the poor paying more for less water. This may also be worsened by irregular supply of water to the city. If the

household cannot afford enough water, then critical activities such as cleaning, flushing toilets, and washing may be affected. This could engender the health of the household members. Some locations in the city are prone to environmental pollution problems which may result in diseases. Children are especially vulnerable to diseases in places such as Nima, Alajo, Abofu, North Industrial Area, and Sabon Zongo. Land based livelihoods in the peri-urban areas are threatened because the lands have been sold to developers. Thus, households are losing potential income.

Chapter five expands further on people's perception, attitudes, and behaviour relating to water and environment (natural assets and how they are affected by other assets and factors) which have constrained the opportunities available to households in terms of access to surface water due to unrestrained pollution.

CHAPTER 5 : PERCEPTIONS, ATTITUDES AND BEHAVIOUR IN RELATION TO SURFACE WATER AND ENVIRONMENTAL QUALITY.

Chapter five presents findings related to the research question two: **Do perceptions, attitudes and behaviour have an effect on the quality of surface water and environment and can this be influenced?** The discussion presents the different considerations that people take into account in developing perceptions about water and environmental quality. People's considerations may include factors such as observations and experiences in relation to the use of particular water sources. In developing perceptions, attitudes, and behaviour towards water and the environment, people may be influenced by performance in service provision to reduce pollution in the water and environment sectors, specific behaviours which may protect or pollute the water and environment, as well as how efforts are put in by individuals and communities to value and protect water and environmental resources. The chapter explores the above aspects. The observations from the combination of these factors may enable people to identify from their perspectives, how the current pollution problems in the city could be addressed.

Chapter five combines results of the focus group discussions and the household interviews. Respondents views derived from the analysis of the attitude statements are incorporated into the presentation. The attitude statements from the household interviews were based on the concepts or ideas which were distilled from the focus group discussions (therefore when indicated as a Table title, it is placed in inverted commas). In the presentation, the themes and concepts or ideas which emerged from the focus group discussions are indicated accordingly (see chapter 3, section 3.2.1 to 3.2.1.3; Table 3.8; and Appendix 3.7; on how the focus group discussions were analysed). Where it is relevant, the concepts are supported with examples of statements made by informants expressing people's attitudes to water. The responses to the attitude statements were analysed by community and by sex of respondent, however the latter is included where differences were significant.

5.1 PERCEPTION OF WATER QUALITY IN RELATION TO SANITATION AND SOLID WASTE DISPOSAL PRACTICES.

This section discusses various concepts which were distilled from the focus group discussions on the communities' perception of water quality. Key points were first

identified from the focus group discussions. Codes, which were either words or phrases, were created from these key points. The codes were compared and similar ones grouped together and labelled as concepts. The concepts were also compared and similar ones grouped together and labelled as themes. This process was repeated for all the focus group discussion notes from all the ten communities.

5.1.1. Perception of water quality based on physical impression/features

An important concept in the communities' perception of water quality was the water's physical features.

'The odour of the water changes in the dry season especially when livestock hovers around and in it'. 'There is no problem with the river because it flows each time and it is clean'. 'The ponds, because they are a standing water body, when it rains, wastes from the environment is washed into it'. 'The water is clean and I like it' (mixed focus group, Abokobi-Pantang) (see also Appendix 5.1, and Figure 10).

'The water contains solid waste' (men's focus group, Agbogba).

What people observe in and around the river is associated with notions of threat or no threat to the water quality and therefore determines their perception of the water's suitability for domestic, non-domestic, and commercial use. Table 5.1 below indicates that in all ten selected communities, responses to the attitude statement: *'uncontrolled disposal of liquid and solid waste affects the quality of the river'* were highly in agreement (over 80% agreed in all cases).

This shows that community members have no difficulty in perceiving water quality based on physical impression. Therefore it is expected that if there is agreement about the *attitude* statement, then the action should be to avoid that practice in terms of the actual behaviour, if attitudes predict behaviour [see theory of planned behaviour, chapter 2, section 2.5].

Table 5.1: ‘Uncontrolled disposal of liquid and solid waste affects the quality of the river’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	92.5(37)	5(2)	2.5(1)	40
Agbogba [P]	100(42)	-	-	42
Abelemkpe [H]	97.4(38)	-	2.6(1)	39
Dzorwulu[H]	82.5(33)	17.5(7)	-	40
Kokomlemle [H]	100(43)			43
Nima [M]	100(69)	-	-	69
Alajo[M]	97.6(41)	-	2.4(1)	42
Abofu [L]	95.5(42)	-	4.5(2)	44
North Industrial Area [L]	100(40)	-	-	40
Sabon Zongo [L]	100(43)	-	-	43
Total sample	96.8(428)	2(9)	1.1(5)	442

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

In Abelemkpe, perceptions of water quality were formed from the use of the senses; largely what people are observing and in some cases the odour from the water as mentioned above. The surface water is perceived to be unclean and therefore of low quality. This leads people to form the notion that the water is polluted and therefore consider it functionally as a drain (channel for waste water). Surface water is considered to have lost the status of a ‘river’ and is therefore comparable to any channel in the city which serves as conduit for wastewater. Thus people do not seem to be surprised about the content of the water body.

‘The Odaw River flowing through the city is in a poor state and this is obvious because it contains everything, including waste from the Accra Brewery Company Limited’ (mixed, men’s, young adults’ and women’s focus group, Abelemkpe. The Accra Brewery Company is about 2 kilometres upstream/before Abelemkpe).

‘The surface water body is a very big drain’ (mixed focus group supported with similar statements by young adults’ and women’s focus group, Abelemkpe).

Therefore in Abelemkpe, the explanation takes into account the deterioration of the water quality which began when industrial effluents were discharged into the water body without any form of treatment. This source of pollution is still a threat to the river as it flows towards the sea where there are a constellation of industries (located on the outskirts of the community of North Industrial Area also called Avenor, and beyond).

People in Dzorwulu referred to the discharge of liquid and solid waste into the river. People's perceptions are based on observations in the water body. Such as the colour of the water, the 'turbidity' of the water and the nature of the solid waste observed in the water. It is the observation of this combination of physical features that helps people to understand the state of the surface water quality.

'The river [water] is bad and has been caused by the fitting shops along the river, defecation along the river, wastewater intrusion, and car washing' (mixed focus group, Dzorwulu).

'People still consider the river as nothing more than a drain'. 'Yes, there is a river flowing from the ridge and formally one could see water snails in it' (mixed focus group, supported by young adults' and men's focus group discussions, Dzorwulu)

'Good quality water should have no wastes in it and the water should be useful for various activities' (men's focus group, Kokomlemle).

Thus, in Abelemkpe, Dzorwulu and Kokomlemle, all of which are communities with high infrastructure provision [also high environmental quality], perceptions of water quality were primarily based on physical impressions.

Similarly, in Nima and Alajo, both with medium infrastructure provision, understanding of water quality is related to physical observations and these influence the way the water body is defined. In Nima, the water body was considered degraded and therefore the constructed channel for the river through the community was considered a wastewater drain (Plate 5.1).



Plate 5.1: A section of the river channel at Nima in the dry season

In Alajo, the occurrence of wastes and other substances make the water body unsafe for any activity.

'If the water body were a river, you would see it being cleaned and people fetching water from it for some activity'. 'I have heard from the elders that it used to be a river' (women's focus group, Alajo).

Industrial activities also contribute to the observed physical condition of the water body. People's perceptions of water quality were similar in Abofu, North Industrial Area, and Sabon Zongo, all communities with low infrastructure provision. In Abofu, similar to Abelemkpe and Dzorwulu, perceptions of water quality lead to the view that the water body is a river and yet functionally serving as a channel for wastewater (Plate 5.2).



Plate 5.2 : A section of the river channel at Abofu in the dry season

'The river is of low quality'. 'I wake up at 4:00am and I see people disposing of solid waste into the river'. 'I confront such people but there are no responses'. 'Some parents also send children to dispose of solid waste into the river'. 'I can see polythene bags are scattered all over' (mixed focus group, Abofu).

'It is a river because it flows from afar'. 'It is a river because in the past people used it for several activities'. 'What I know is that a good river should serve for drinking or domestic purpose' (Young adults' focus group, Abofu).

In North Industrial Area, there was no consensus on whether the polluted river, should be considered as a drain (wastewater channel) or a river. People's perception of water quality is influenced by observation of effluent discharged into the river and this forms part of the construct of water quality within the community (Plate 5.3).

'The Odaw River is in a poor state because it contains human waste'. 'The river has now been destroyed' (young adults' focus group, North Industrial Area).

Therefore people's experiences about the environment enable them to offer explanations on their perceptions of water quality.



Plate 5.3: A section of the river channel at the North Industrial Area in the wet season (see effluent outlet in picture shown by arrow)

'Poor quality water is polluted with toxic waste and plastic as a result of lack of maintenance by city authorities'. 'Currently the water body is just a drain (wastewater channel) and not a river'. 'Improper disposal of human waste occurs and measures are needed to address that'. 'The environment is unsanitary'. 'The drains are not cleaned regularly and as such are choked'. 'The drains in the community eventually connect to the Odaw- Korle system' (All four focus groups, Sabon Zongo).

Therefore in all the ten selected communities, assessment of water quality based on physical impressions is an important dimension of people's overall perception of water quality.

5.1.2 Perceived health consequences from water use

In some of the ten communities the *perceived health consequences from water use, the perceived health consequences from contact by vulnerable groups and the perceived health consequence from use by livestock* (all concepts) were generated from focus group discussions, allowing people to explain their perceptions of water quality in relation to whether water use is associated with a particular health consequence or not.

In Abokobi-Pantang: *'there are no perceived health risks to children by contact with the water'* (mixed focus group and supported with similar statements by the other three

focus groups, Abokobi-Pantang) (see Appendix 5.1; Figure 10, which shows water quality at Abokobi-Pantang is relatively safer than other sample locations).

In Agbogba, the health aspect was not a priority because the raw water was only used for construction or uses which exclude contact with humans, whereas a well by the river was used for domestic activities; unlike Abokobi-Pantang where water from the river and series of ponds/dugouts were used for various domestic activities.

In Abelemkpe and Dzorwulu, health issues in relation to use of surface water did not emerge in the discussions as a current concern, although community members indicated such problems existed in the past. In Dzorwulu, where urban farmers are using the water to cultivate crops, there are public health concerns (Amoah *et al.*, 2005), but these farmers live outside the community. Hence, the community did not consider that as priority for its members.

In Kokomlemlé, perceived health consequences were related to the possible effects of contact with the water, especially by children, not only from Kokomlemlé, but other adjoining communities.

'Poor quality water affects children in particular' (women's focus group, Kokomlemlé).

In Nima, the tributary of the river flowing through the community is considered as wastewater (as indicated above) and therefore there is less risk of contact by vulnerable groups such as children (since the water flows through an open, wide, and deep channel with straight sides and therefore makes access by children difficult; see plate 5.1 and 5.4). In Alajo, *perceived health consequences from contact with the river* were related to the fact that the water body, with all the wastes sources, is a source of diseases and a risk to the vulnerable groups, especially the children in the community (who often go fishing in it).



Plate 5.4: Children play near river channel at Nima in the dry season (this is a tributary to the main river course through Alajo)

In Abofu and in North Industrial Area, perceived health consequences from contact with the river by vulnerable groups did not emerge from discussions, though there is the possibility that children go fishing in Abofu and in North Industrial Area, children are occasionally seen fishing in the river. In Sabon Zongo, the perceived health consequences were seen to affect children and youth who tend to explore their environment and in the process come into contact with the water source.

In Sabon Zongo, the *perceived health consequences for livestock from contact with the water* was generated from focus group discussions. These were related to the fact that livestock may drink these polluted sources of water and zoonotic diseases [diseases transferred between humans and animals, for example, tape worm] may be passed into the human food chain, thus putting humans at risk of infections.

'The stench is detrimental to human health'. 'Children are playing around and it could affect them'. 'Animals drinking from it may also transfer diseases to human' (mixed focus group, Sabon Zongo).

'The river [water] quality is important for this community because of our livestock and for farmers in this community' (women's focus group, Sabon Zongo).

5.1.3 Perception based on historical change in uses

Perception based on historical change in uses in relation to water quality was a concept that was generated from separate focus group discussions. The explanations given in the discussions indicated that perception is formed by knowledge and experience of different uses of the water at specific periods in the past.

Abokobi-Pantang is less populated (see chapter 3: section 3.1.4.1) than the urban centres and also has no industrial establishments. This situation guarantees a certain level of water quality which allows safe use of the water for different activities. Though some specific uses in the past are no longer the case today because the water quality at Abokobi-Pantang has been declining over the years, it is still of good enough quality to guarantee safe use for specific domestic activities (such as washing, bathing, cleaning, among others) [see water quality analysis in Appendix 5.1; consider the dissolved oxygen, biological oxygen demand and the faecal coliform counts] as well as for building construction. In the past, use included drinking, but not today and the reasons are that there is a better alternative source for drinking purposes and secondly, the quality has declined in comparison with the past. The gradual change in the quality of the water over time defines current uses in different communities.

'Five years ago, the water quality was far better than currently' (men's focus group, Agbogba).

'As far back as 1971, the water was drunk because it was clean. People stopped drinking when the Accra Brewery Company [ABC] started discharging waste into it'. 'Kids used to swim in it when it was no longer used as a source of drinking water and stopped when the water eventually got dirty'. 'People dispose human and solid wastes into it'. 'If the quality of the water improves it could be used for construction' (mixed focus group, Abelemkpe).

In Dzorwulu, past uses ranged from domestic activities to non-domestic, but there is no record of use for drinking purposes.

'At first the water flowing in the community was good but following development of settlements, it is no longer good'. 'In the past we used to wash there, but not today' (women's and men's focus group, Dzorwulu).

In Kokomlemle, the notion of pollution allowed people to relate to what has happened to the water and the likely processes that it might have gone through.

'The Odaw River in Accra used to be good, but today it is polluted from human and solid waste disposal' (women's focus group, Kokomlemle).

In Nima, perceptions were related to people's explanations of timelines along which the water was subjected to various uses and how these uses have changed over the period.

'As at 1960, the river was clean and around 1970, people used it for car washing' (women's focus group, Nima).

In Alajo, changes in water quality were related to a comparative analysis of changes in water use over a period; this is on the premise that the quality of the water body determines the nature of its use. In Abofu, there were explanations to the effect that there are certain uses of the water that lead to pollution, and that even if the water quality improves, it may be difficult for domestic or productive uses to be considered in future. A typical example was the use of a section near Abofu as a city approved human waste [faecal matter] tipping point in the past.

‘The river flows from the mountains’. In the past, the people used the water for drinking and other activities in the 1960-70s but when Accra Brewery Company started polluting it with their effluent, and sewage trucks also discharged into it, we could use it no longer’ (women’s focus group, Abofu).

In North Industrial Area, explanations considered the ecological uses and resources that have changed over time; for instance it is known that in the past, fishing could be carried out at sections of the river near North Industrial Area, but not in the same measure today due to the changes in water quality.

‘In the early 1990s people used to fish in the Odaw-River frequently’. ‘Today, it is the children who are occasionally seen at some sections, trying to catch fish’ (young adults’ focus group, North Industrial Area).

5.1.4 Perception of water quality and its influence on current and prospective uses

Perceptions of people allow them to use or consider a prospective use for the water; for example, in Abokobi-Pantang:

‘I use the Dakobi [river] water for bathing, washing, and nursing of crop’. ‘The Dakobi [Odaw-River] is for washing, in the past it was for drinking’. ‘At Pantang, when the taps are not flowing we use the ponds for washing and bathing’ (mixed, women’s and young adults’ focus group, Abokobi-Pantang).

In Abelemkpe, people expressed their knowledge of the extent of degradation and behaviour (such as solid waste disposal) towards the water body in their community, but were aware that water of appreciably good quality was used for some activities in Abokobi-Pantang and Agbogba [that is focus group participants made reference to water quality in other locations]. In Dzorwulu, separate focus group participants said that:

'There is no river passing through Dzorwulu'. 'It is a wastewater channel'. 'The water currently can be used for construction, to flush toilet, and wash cars' (women's and men's focus group, Dzorwulu).

Since the community play host to urban farmers, the water at this point is used for crop cultivation, but the farmers live outside the community (as mentioned above).

In Kokomlemle, understanding of water quality led people to present explanations with reference to their knowledge of the water course to describe different uses at different locations. Such explanations included the use of the water for domestic, non-domestic, and commercial purposes. The emphasis in this explanation is on the element of location and the nature of use.

'People use it for construction, car washing and crop cultivation at particular locations' (men's focus group, Kokomlemle).

No uses of surface water were indicated at Nima, where the river is currently seen as wastewater or at Alajo, where it is highly polluted. Since it is acknowledged that the water is of no use in the community, their broad explanations is presented in relation to uses at specific locations on the course of the river, of which people are aware, apart from the experiences in their own communities.

'In this community, there is no river passing; it is just a big wastewater channel' (mixed focus group and supported with similar ideas in women's and young adult's focus groups, Nima).

In Abofu and North Industrial Area, it was understood in relation to the extent that quality may have to be improved before specific uses could be suggested.

'Today there is solid waste in the water, wastewater is entering, and human waste is being poured from buckets into it' (Women's focus group, North Industrial Area).

5.2 PERCEPTION, ATTITUDES, BEHAVIOUR AND PRACTICES INFLUENCING SURFACE WATER AND THE ENVIRONMENT

The above theme which is defined by the following recurring concepts was distilled from discussions in separate focus groups in the ten communities:

- *High level of access to in-house toilets controls discharge of human waste into the environment; Limited access to in-house toilets¹ leading to high patronage of public toilets;*
- *Low hygienic condition of public toilet promotes behaviour that pollutes the environment;*
- *Formal and informal participation in the provision of public toilets;*
- *'Open' /observed and 'hidden' behaviour, practices and patterns of solid and human waste disposal leading to pollution;*
- *Formal and informal participation in the provision of solid waste collection services.*

The discussions of the above concepts are presented below and the results of the attitude statements from the household interviews are also integrated.

5.2.1 Level of access to in-house toilets and environmental pollution

Concept: *High level of access to in-house toilets controls discharge of human waste into the environment*

In Abelemkpe, Dzorwulu, and Kokomlemle, the importance of a high level of access to in-house toilets for controlling discharge of human waste into the environment was generated from separate focus group discussions possibly because the majority of respondents had in house toilets (Abelemkpe: 74.3% of households had flush toilet while 28.2% had other toilet; Dzorwulu: 92.3% had flush toilet while 7.7% had other toilets; Kokomlemle: 74.5 % had flush toilet while 7.1% had other toilet). Furthermore, the majority of respondents in all three communities agreed with the attitude statement that the communities have high access to in-house toilets (Table 5.2).

¹ *Note: the term 'in-house-toilet' is used to refer to the availability of a toilet in a house, in preference to the term 'household toilet'. The in-house- toilet may be used by more than one household living in shared accommodation; the term 'household' is used in the thesis to refer to a person or group of people or family who live together and draw their sources of up keep from a common income or resource pool*

Table 5.2: ‘The majority of people have access to toilets in their houses’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	38.5 (15)	-	61.5(24)	39
Agbogba [P]	57.1 (24)	23.8 (10)	19.0 (8)	42
Abelemkpe [H]	89.7 (35)	2.6 (1)	7.7 (3)	39
Dzorwulu[H]	97.5 (39)	-	2.5 (1)	40
Kokomlemlle [H]	74.4 (32)	9.3 (4)	16.3 (7)	43
Nima [M]	27.1(19)	1.4(1)	71.4 (50)	70
Alajo[M]	35.7(15)	4.8(2)	59.5 (25)	42
Abofu[L]	59.1 (26)	18.2 (8)	22.7 (10)	44
North Industrial Area [L]	35 (14)	12.5 (5)	52.5 (21)	40
Sabon Zongo [L]	32.5(14)	4.7 (2)	62.8 (27)	43
Total sample	52.5 (232)	7.7(34)	39.8(176)	442

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

A little over half of the respondents in Agbogba agreed with the attitude statement. This was also below the actual access to a toilet by households (32.4% had flush toilet while 67.5% had another type of toilet - either pit or Kumasi Ventilation Improved Pit—KVIP). In Abokobi-Pantang, there were *limited in-house toilets* (also only 7.5% had flush toilet while 65% had pit latrine) and a *lack of public toilets* which leave people only one option— open defecation in the environment. In Abokobi-Pantang, the position of the majority of respondents on the attitude statement did not agree with the actual access to toilets by households. However, in Nima, the majority of people disagreed with the attitude statement ‘the majority of people have access to toilets in their houses (Table 5.2) and this was confirmed in the household survey in which 17.1% of respondent indicated that they had flush toilet and 30% indicated that they had other toilets in their houses.

Therefore there is high demand for public toilet services. The groups expressed the relationship between *limited access to in-house toilets and high patronage of public toilets*. The situation in Nima is similar to Alajo (26.8% had flush toilet while 19.5% had other toilet), North Industrial Area (7.5% had flush toilet while 18.4% had other toilet) and Sabon Zongo (11.6 % had flush toilet while 10.3% had other toilet) where group discussions also indicated that limited in-house toilets (Table 5.2) led to high

demand for, and patronage of public toilets. Due to the high demand, it is common to have queues at public toilets especially in the mornings. Though Abofu is grouped in the low infrastructure provision, access to toilet was high (65.9 % had flush toilet while 4.5% had other toilet). Thus, in terms of access to in-house toilets, Abofu is ahead of North Industrial Area and Sabon Zongo, though public toilets in Abofu were not functional during the period of the survey.

Nima, Alajo and Sabon Zongo have attracted the participation of the informal private sector or individuals to invest in provision of toilets; thus the groups discussed *formal and informal participation in the provision of public toilets*.



Plate 5.5: Privately owned public toilet at Nima

This offers a win-win situation where local investors support sanitation and pollution control while deriving income from their investments. Therefore in Nima, Alajo, and North Industrial Area and Sabon Zongo (Table 5.2), the high level of negative response implies that many people have to depend on toilets outside their homes.

Across the city, various toilet technologies exist and in the case of Alajo, apart from water closets and Kumasi Ventilated Improved Pit (KVIP), a limited number of people in the community have pit latrines. Focus group informants indicated that this is a nuisance to community members because of inadequate maintenance. It was also reported in discussions that a limited number of people in Sabon Zongo use pan latrines

(none volunteered to show me their locations, possibly for fear of incurring the displeasure of affected houses since the city was phasing them out by then).

Furthermore, in Accra, people who cannot afford the cost of accessing public toilets are compelled to consider alternatives. Hygiene in public toilets is poor and therefore discourages some people from patronizing them at all, due to the associated health risk.

Table 5.2 shows there were statistically highly significant differences in the responses between the different communities (χ^2 , 18df=165.68, P=2.2e-16) in Table 5.2. This means that if the proportion who agreed with the attitude statement is compared in the communities they differ significantly.

5.2.2 Behaviour and water and environmental pollution

Concept: 'Open'/observed and 'hidden' behaviour, practices and patterns of solid and human waste disposal leading to pollution

Open or observed behaviour is what community members see others do. The notion of hidden behaviour relates to people who usually go to the river in the night to dispose of solid or human waste into the water. In Abokobi-Pantang, open defecation is practiced for lack of alternatives (for those without in-house toilet) and there is some level of open defecation in Agbogba due to the limited availability of flush toilets in some houses. Usually when alternatives such as pit latrines are full, it may take time before it is emptied or a new one dug. However open defecation appears to be on a small scale given the relatively low populations of Abokobi-Pantang and Agbogba, and because of the socio-economic status of the majority of households in Agbogba [chapter 4: section 4.4.3; Fig. 4.40 and Fig. 4.41] that enables them to afford decent sanitation and solid waste collection services. The current pollution load is therefore likely to be low as observed by the water quality analysis [Appendix 5.1].

In both Abokobi-Pantang and Agbogba, there was in general, a high level of agreement on the possible effects of human waste carried from the environment into the water (Table 5.3). However, despite agreement with the attitude statement that open defecation into the river affects the quality of the water, the limited number of toilets and also lack of influence from the community members in discouraging open defecation, means that people are likely to consider and pursue alternatives, including

open defecation. It was discussed in the focus groups that open defecation occur in Abokobi-Pantang and in a few cases in Agbogba. This was confirmed by the water faecal coliform counts in Abokobi-Pantang and Agbogba (Appendix 5.1 and its Figure 10). This indicates that high levels of agreement with an attitude statement do not necessarily lead to good behaviour if other conditions are equally not met in the situation.

Table 5.3: ‘Open defecation into the river affects the quality of the water’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	90.0 (36)	7.5 (3)	2.5 (1)	40
Agbogba [P]	100 (42)			42
Abelemkpe [H]	94.9 (37)	2.6 (1)	2.6 (1)	39
Dzorwulu[H]	82.5 (33)	17.5 (7)	-	40
Kokomlemle [H]	100 (43)	-	-	43
Nima [M]	95.7 (67)	1.4 (1)	2.9 (2)	70
Alajo[M]	100 (42)			42
Abofu[L]	93.2 (41)	2.3 (1)	4.5 (2)	44
North Industrial Area [L]	100 (40)	-	-	40
Sabon Zongo [L]	100 (43)	-	-	43
Total sample	95.7(424)	2.9(13)	1.4(6)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=38.47, P=0.003351) in Table 5.3, thus emphasizing that community differences are important considerations in any interventions.

In Abelemkpe, Dzorwulu, and Kokomlemle, the community members discourage pollution; most have an adequate toilet in their houses and there was high agreement with the attitude statement concerning the impact of open defecation on water quality (Table 5.3). Given these factors, these communities would be more likely to act in ways which do not pollute the environment and this is what was observed on the ground and was also discussed in the focus groups. Thus, the high agreement on the effect of human waste on the river (Table 5.3) is consistent with the general behaviour of actual community members. Nevertheless, in Kokomlemle and Abelemkpe, it was suspected

that a limited number of residents may also take advantage of rainy periods to dispose solid and human waste into the environment.

'[we] have heard that non-community members dispose of human waste and solid waste into the river' (young adults' focus group, Kokomlemle).

'Some also dispose solid and human waste into the environment when it is raining'. 'Still some people dispose solid and human waste into the river and its environment at night' (mixed focus group, Abelemkpe).

In Abelemkpe, the disposal of solid and human waste is the two major sources of pollution in the community, although the pollution contribution from the community is in general perceived to be low. Households having problems with their toilet systems as well as those who lack access at all need to consider alternatives. However, since all three communities are open to the public, the communities' perception is that a transient population contributes to aspects of pollution observed along the tributary of the river in Dzorwulu and the main river in Abelemkpe and near Kokomlemle, which flows along one side of the communities. In the case of Kokomlemle, the river is about 0.5 km from the community with drains (channels) from the community discharging wastewater into the river. The transient population could include people coming to the communities to render services or to carry out some activity such as building construction. Contributions to pollution in the communities are largely perceived to be significantly externally influenced, including waste carried from adjoining communities into the community. Solid waste disposal practices, the transient population, and people from adjoining communities are perceived to influence the surface water quality.

It is important to note that all the selected communities indicated the common practice of wrapping and disposal of human waste in the river and its immediate surroundings (Table 5.4). However, this was not presented as a practice of community members per se as explained above in Abelemkpe, Dzorwulu and Kokomlemle, but rather of 'outsiders'. Therefore the high agreement (Table 5.4) is very much in line with what is observed in the river [solid waste, black plastic bags likely to contain human waste] at Abelemkpe and Kokomlemle [but not in the spaces and sections within the residences as that looked relatively tidy].

Table 5.4: ‘Wrapping and disposing of individual human excreta into the river and its surroundings is common in this community’.

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	62.5 (25)	7.5 (3)	30 (12)	40
Agbogba [P]	59.5 (25)	9.5 (4)	31 (13)	42
Abelemkpe [H]	84.6 (33)	5.1 (2)	10.3 (4)	39
Dzorwulu[H]	50 (20)	22.5 (9)	27.5 (11)	40
Kokomlemle [H]	83.7 (36)	4.7 (2)	11.6 (5)	43
Nima [M]	92.9 (65)	2.9 (2)	4.3 (3)	70
Alajo[M]	92.9 (39)	4.8 (2)	2.4 (1)	42
Abofu[L]	79.5 (35)	2.3 (1)	18.2 (8)	44
North Industrial Area [L]	95 (38)	5 (2)	-	40
Sabon Zongo [L]	81.4 (35)	4.7 (2)	14 (6)	43
Total sample	79.2(351)	6.5(29)	14.2 (63)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

In Dzorwulu, the presence of urban farmers possibly reduces the incidence of human waste wrapping and disposal along greater stretches of the river in the community. Farmers get to their farms at dawn and leave in the evening. A bank of the river, which is easily accessible, is also cultivated. Explanations were also grounded in the fact that there are no public toilets in Dzorwulu and Abelemkpe [to be used by visitors or transient populations], although Kokomlemle has a small one. The community members of Abelemkpe and Dzorwulu do not plan to allow the construction of public toilets because of the supposed socio-economic ‘status’ of these two communities (chapter 4: section 4.4.3; Fig. 4.40 and Fig.4.41).

The community of Nima as a unit discourages pollution by human waste disposal (as indicated in discussions and interaction within the community). There are also public toilets for people without in-house toilets and therefore the expected behaviour is for people not to engage in open defecation or wrapping (Table 5.4) and disposal of human waste into the environment. However, that is not the situation in all cases. In Nima, community members lacking the capacity to pay for public toilets are suspected of engaging in open defecation into the water body under the cover of darkness either at dawn or in the night. Some people may also wrap the human waste and throw it into the

water channel [which is totally wastewater at this point and thus the designation ‘a drain’, as mentioned above].

This is against the back drop that there was high agreement with the attitude statement on the harmful effect of open defecation on the river (Table 5.3). This is another case where agreement on the attitude statement does not agree with observations on the ground in terms of community behaviour (as discussed by informants in focus group). Explanations given by community members include the inability to pay for the toilet services, or a deliberate show of behaviour which leads to pollution. In contrast, the high level of agreement with the attitude statement on wrapping and disposal of human waste into the water in the community (Table 5.4) is a true reflection of what is happening on the ground, with no external influence (as discussed by informants in the focus groups; as well as observations in the field).

In Alajo, some individuals were also noted to engage in open defecation or to wrap the human waste and dispose it in the water body (Table 5.4), as, ‘*open defecation occurs at the river banks*’ (young adults’ focus group discussion).

In Abofu, North Industrial Area and Sabon Zongo, the high agreement on the attitude statement on wrapping and disposal of human waste being common in the communities (Table 5.4) is in line with observations and behaviour on the ground (as discussed by informants in focus groups). In Abofu there are no functioning public toilets even though some people lack in-house toilets. The community, in general, discourages pollution (as it emerged in discussions by informants) and there is high agreement with the attitude statement (Table 5.3) and therefore likely behaviour would be for people to act in a pro-environmental manner. However, the absence of functioning toilets to some extent results in open defecation and wrapping and throwing away of human waste into the environment. Although people are aware of its environmental effects (Table 5.3), it is still a common practice.

‘There is no functioning public toilet in the community. There is indiscriminate defecation’ (mixed focus group, Abofu).

In the North Industrial Area, the community discourages pollution in order to protect the environment; there is also high agreement with the attitude statement (Table 5.3). Public toilets are available for households who lack an in-house toilet. Therefore a likely

behaviour would be for people to use the public toilet and not indulge in open defecation or wrap and throw into the environment. This is also a case where likely behaviour arising from a positive attitude is not in agreement with observed behaviour (as discussed in focus groups); a confirmation of the fact that people are aware of their actions and inactions. In North Industrial Area, due to the weak monitoring systems by the city authority, public toilets are not hygienically managed and therefore may discourage some individuals from using them and compel them to consider alternatives. Such people may indulge in open defecation or wrap the human waste and drop it in the environment or into the river.

'Along the river channel one may find some individuals openly defecating'. 'Some people wake up at dawn to defecate into the river'. 'One has to pay to use the toilet even if suddenly has the urge'. 'The stench in the toilet may also discourage some people from using it' (mixed, men's and women's focus groups, North Industrial Area).

The situation in Abofu and North Industrial Area is also observed in Sabon Zongo where behaviour leading to pollution is demonstrated in several forms, such as open defecation, wrapping of human waste in plastic bags and disposal into the environment, the addition of human waste into wastewater before discharged into drains, and solid waste disposal. Most informants agreed with the attitude statement (Table 5.3), and public toilets (KVIP, Pit latrine) are available. Therefore, the predicted behaviour arising from the positive attitude would be pro-environment. However, this does not happen, but high numbers reporting open defecation or wrapping (Table 5.4) and throwing of human waste into the water and environment.

'Residents pay to access the public toilet'. 'Some people are excluded because they cannot pay. Such people wrap the human waste into polythene bags and keep it in the house till night and dispose it in the wastewater channel'. 'The practice in the community is that some people throw solid waste into the surroundings when it is raining'. 'There are some who have constructed pan latrines in their houses and have connected them with pipes into the drains, and what these people do is to pour the human waste into the pipes at night' (mixed group, young adults', women's and men's focus groups, Sabon Zongo).

These behaviour and practices could have health consequence on the lives of people living in these communities. There was statistically highly significant difference in the responses between communities (χ^2 , 18df=68.18, P=9.159e-08) independent of sex of respondent in Table 5.4. Therefore future interventions must factor in specific community issues and concerns.

In another form of human waste disposal (Table 5.5), some people are noted for throwing buckets of human waste into the Odaw-Korle River in the city. Community members indicated their knowledge of such practices within the wider city and not necessarily in their specific communities.

Table 5.5: ‘I am aware that there is uncontrolled disposal of human excreta from pan latrines into the Odaw River’.

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	20 (8)	12.5 (5)	67.5 (27)	(40)
Agbogba [P]	45.2 (19)	2.4 (1)	52.4 (22)	(42)
Abelemkpe [H]	82.1 (32)	12.8 (5)	5.1 (2)	(39)
Dzorwulu[H]	43.6 (17)	28.2 (11)	28.2 (11)	(39)
Kokomlele [H]	74.4 (32)	7 (3)	18.6 (8)	(43)
Nima [M]	64.3 (45)	1.4 (1)	34.3 (24)	(70)
Alajo[M]	88.1 (37)	7.1 (3)	4.8 (2)	(42)
Abofu[L]	79.5 (35)	4.5 (2)	15.9 (7)	(44)
North Industrial Area [L]	82.5 (33)	12.5 (5)	5 (2)	(40)
Sabon Zongo [L]	79.1 (34)	7 (3)	14 (6)	(43)
Total sample	66.1(292)	8.8 (39)	25.1(111)	(442)

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

Abokobi-Pantang expressed low (20%) knowledge of such a practice, while about half of the respondents from Agbogba, and Dzorwulu indicated awareness. This awareness was high for the other communities, indicating a need for its investigation and measures to stop such a practice. There were statistically highly significant differences in the responses between communities (χ^2 , 18df=121.38, $P=2.2e-16$) independent of sex of respondent in Table 5.5. This indicates that there are real differences in knowledge between communities.

In Abofu, and in fact in all communities where there are activities which pollute the environment, solid and human waste pollution usually occur in the dark which suggests that offenders are aware of their actions. In some instances, children were also asked by their parents to dispose solid waste into the river (therefore contribute to pollution in the river).

Some informal collectors of solid waste (that is, not licensed by the city to collect solid waste) were also culprits of pollution because after collecting the solid waste and having been paid, they dump the waste in the local environment. Inefficiencies in the formal collection of solid waste (licensed by the city) create opportunity for informal collectors. Table 5.6 below indicates that communities showed high agreement with the attitude statement: ‘Informal solid waste collectors are part of uncontrolled disposal of solid waste into the environment’.

Table 5.6: ‘Informal solid waste collectors are part of uncontrolled disposal of solid waste into the environment’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	70 (28)	20 (8)	10 (4)	40
Agbogba [P]	100 (42)			42
Abelemkpe [H]	89.7 (35)	5.1 (2)	5.1 (2)	39
Dzorwulu[H]	90 (36)	7.5 (3)	2.5 (1)	40
Kokomlemle [H]	83.3 (35)	7.1 (3)	9.5 (4)	42
Nima [M]	97.1 (68)	1.4 (1)	1.4 (1)	70
Alajo[M]	81 (34)	9.5 (4)	9.5 (4)	42
Abofu[L]	97.7 (43)	2.3 (1)	-	44
North Industrial Area [L]	80 (32)	12.5 (5)	7.5 (3)	40
Sabon Zongo [L]	86 (37)	2.3 (1)	11.6 (5)	43
Total sample	88.2(390)	6.3(28)	5.4(24)	442

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically high significant differences in the responses between communities (χ^2 , 18df=45.326, P=3.718e-04) independent of sex of respondent in Table 5.6. Thus the differences between communities are important. In the case of Abokobi-Pantang, perhaps the position (70% agreement on Table 5.6) reflects people’s knowledge about the catchment since informal solid waste collection is not practiced there and it did not come up in the focus group discussions. For that reason, Abokobi-Pantang was not expected to show such high agreement.

In Abelemkpe, Dzorwulu, and Kokomlemle, there was high agreement with the attitude statement that informal solid waste collectors are part of uncontrolled disposal of solid

waste into the environment. It was suspected that informal collectors dispose of the waste in the river. However, this was not the case with all informal collectors at Dzorwulu which therefore offers one example of what possible informal integration could add to the waste collection system of the city as well as offering job opportunities to some people.

In the medium and low infrastructure provision communities, there are also informal collectors operating in the community. After collecting the waste and being paid, they dispose of it at the wrong places and therefore pollute the environment [behaviour leading to pollution].

‘There is indiscriminate disposal of solid waste into the environment as well as into the drain’. ‘The government is to be blamed for bins which stand full for 2-3 days’ (men’s and young adults’ focus group).

In addition to the inadequacy of city funded solid waste collection bins (see plate 5. 6), as mentioned earlier, the informal collectors offer house-to-house services.



Plate 5.6: City funded solid waste collection bins at Nima

‘There are some individuals called ‘Kaya-Bola’ [informal collectors] who go round to collect solid waste from homes at a fee. There are some who after collection dump the waste behind people’s windows or just any obscure place’. ‘The process of littering also contributes to the pollution load in the community, to the extent that drains [wastewater channels] in the community get blocked with waste. This restrains flow of wastewater and run-off leading to local flooding at some sections of the community’ (men’s focus group, Nima) (Plate 5.7).



Plate 5.7: Solid waste littered behind a house at Nima

Behaviour and practices in Nima contribute tremendously to the current state of the water and the environment. Therefore there is an important contribution to the pollution load coming from the community in respect of the volume of solid waste discharged into the environment. Polluters are aware that their actions are inappropriate and therefore largely demonstrate this behaviour in ‘secret’; a few may do it in the day. Others may take advantage of rainfall to discharge waste into the environment.

‘The community members are responsible for the state of the tributary in the community. ‘Rain water washes wastes from the environment into the wastewater channel as people are in the habit of dumping solid waste during rainfall’. ‘We have destroyed the water through open defecation and solid waste disposal’ (From all four separate focus groups, Nima).

5.2.3 Wastewater disposal practices

In Agbogba, similar to Abokobi-Pantang, the surface water serves some useful purposes for the community and therefore the point of withdrawal was kept tidy. Notwithstanding, certain behaviour (wastewater and solid waste disposal, open defecation), threatens the quality and the future of the water resource. Typical of an urbanizing community, a key challenge to the water resource is the development of residential facilities on the banks of the river in Agbogba. Such a development contributes to the discharge of wastewater into the river. The community is concerned and desires that steps are taken to address this before the water gets degraded totally.

Table 5.7 indicates that people in Agbogba showed high agreement with the notion that connecting wastewater drains (these are small size channels through which wastewater flows from people’s residences) to the river has an impact on the river [water] quality.

Table 5.7: ‘The quality of the river water in the city cannot improve so long as wastewater drains [channels] link to it’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	92.5 (37)	2.5 (1)	5 (2)	40
Agbogba [P]	100 (42)			42
Abelemkpe [H]	94.9 (37)	5.1 (2)		39
Dzorwulu[H]	85 (34)	15 (6)		40
Kokomlemlle [H]	93 (40)	4.7 (2)	2.3 (1)	43
Nima [M]	92.9 (65)	2.9 (2)	4.3 (3)	70
Alajo[M]	92.9 (39)	-	7.1 (3)	42
Abofu[L]	100 (44)			44
North Industrial Area [L]	90 (36)	5 (2)	5 (2)	40
Sabon Zongo [L]	72.1 (31)	9.3 (4)	18.6 (8)	43
Total sample	91.4(405)	4.3 (19)	4.3(19)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

In fact, across the city it is a common practice to find wastewater channels leading to the river channel. This is also against the backdrop that all the remaining selected communities showed high agreement on the attitude statement on linking drains to the river and the resulting wastewater pollution and consequences. Though there is high agreement on the attitude statement, lack of a city sewer means people have to look for alternatives and that has included linking to the river. In communities without wastewater channels, the waste water eventually enters the river through runoff.

There were statistically high significant differences in the responses between communities in Table 5.7 (χ^2 , 18df=49.557, P=8.805e-05) independent of sex of respondent. Therefore interventions must consider the uniqueness of the communities.

5.2.4 Solid waste collection services

Concept: *Formal and informal provision of solid waste collection services*

Formal and informal participation in the provision of solid waste collection services and the implications of the cost of these services emerged from discussions in the separate focus groups in the ten communities.

In Abokobi-Pantang, the lack of a solid waste collection and disposal service, results in people disposing of solid waste into the environment, although this is on a very small scale and far removed from sources of surface water (see faecal coliform counts of river[water] at Abokobi-Pantang: Appendix 5.1). Similarly, in Agbogba there is no formal (licensed) public collection of solid waste and therefore the community is expected to engage the services of formal private or informal (unlicensed) companies and individuals to collect their solid waste. It is possible that people who have not signed on to any service providers may take advantage of the vegetation near the river course and other parts of the community to dispose waste into the environment (for further discussion on behaviour from inefficient solid waste collection see section 5.2.2). *‘There are no solid waste disposal points in the community’* (men’s and women’s focus group, Agbogba).

In Abelemkpe, Dzorwulu, and Kokomlemle there is no public collection of solid waste but there are *formal private and informal solid waste collection services*. Some households have signed on to these formal private collectors; others engage the services of an informal solid waste collector. It is the responsibility of each household to employ the services of any of these groups to collect solid waste at a fee.

In communities with medium and low infrastructure provision, such as Nima, Alajo, Abofu, North Industrial Area, and Sabon Zongo, the AMA contracts private solid waste collectors to manage the waste. Therefore, community members are not required by the AMA to pay for the cost of solid waste collection. However, that is not the actual situation on the ground in some of the communities; for instance in Nima, people have to pay before disposing the waste into central collection bins. Some community members are known to be behind this practice, without the approval of the city authority or the contractor responsible for the waste collection. The justification from the team that collects these fees is that it enables them to keep the surroundings of the waste

collection bins clean. It is possible such practices exclude people who may not be able to afford the cost. The practice in Abofu and North Industrial Area is similar to Nima, with residents paying illegal fees to access AMA funded solid waste collection services. In addition, there are informal solid waste collectors who operate in the communities; residents of Abofu and Sabon Zongo have access to both formal and informal solid waste collection services.

In Abofu, households which can afford it can also sign on to fee based formal private collection services. Since people have to pay to access the AMA funded solid waste collection services, which are usually at a distance away from residence, some people may engage the services of informal solid waste service providers who usually offer house-to-house services. Furthermore, it emerged in discussions that when the bins are full and have not been emptied residents have to return home with the solid waste in communities benefiting from AMA funded solid waste collection services, in such circumstances people fall on informal solid waste collection service providers.

Across the city, a common view was presented on the fact that cost of solid waste disposal is expensive and is responsible for uncontrolled disposal' into the water (Table 5.8). The rates charged by solid waste collectors are perceived as likely to exclude poor people who may not be in a position to afford the cost of the service and may therefore be tempted to dispose of their waste into the river (Plate 5.8).

'Community members also pay to dispose their solid waste'. 'Those who are unable to afford this dispose it at night into the river' (women's and young adults' focus groups, North Industrial Area).

There were statistically high significant differences in the responses between communities (χ^2 , 18df=55.594, P=1.033e-05) independent of sex of respondent in Table 5.8. This implies that differences between communities should not be excluded in addressing communities' concerns.

Table 5.8: ‘Cost of solid waste disposal is expensive and is responsible for uncontrolled disposal’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	40 (16)	17.5 (7)	42.5 (17)	40
Agbogba [P]	90.5 (38)	7.1 (3)	2.4 (1)	42
Abelemkpe [H]	66.7 (26)	12.8 (5)	20.5 (8)	39
Dzorwulu[H]	75 (30)	7.5 (3)	17.5 (7)	40
Kokomlele [H]	69 (29)	2.4 (1)	28.6 (12)	42
Nima [M]	84.1 (58)	1.4 (1)	14.5 (10)	69
Alajo[M]	71.4 (30)	4.8 (2)	23.8 (10)	42
Abofu[L]	63.6 (28)	22.7 (10)	13.6 (6)	44
North Industrial Area [L]	70.0 (28)	12.5 (5)	17.5 (7)	40
Sabon Zongo [L]	69 (29)	4.8 (2)	26.2 (11)	42
Total sample	70.9 (312)	8.9 (39)	20.2 (89)	440

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision



Plate 5.8: Solid waste disposal at the river bank at North Industrial Area

Apart from Abokobi-Pantang, where a minority thought the cost of solid waste disposal was expensive, the majority of respondents in all the other communities indicated strong agreement with the attitude statement in Table 5.8 and these are in line with sentiments expressed during the focus group discussions. In Abokobi-Pantang, people rely mainly

on the environment in terms of solid waste disposal. Some were of the view that if solid waste disposal is made affordable, it will control the extent of pollution.

There were a few exceptions such as Alajo, where people do not pay, but there was still pollution attributed to the distance between houses and the disposal bin. The solid waste collection system lacks efficiency. Though no solid waste disposal fees were paid by community members, some people thought that the waste collection points were too far away from their residences and therefore they used other alternatives for waste disposal, some of which result in water and environmental pollution. Secondly, when solid waste collection bins are full, there are delays in emptying them. Both Nima and Alajo are served by the city funded solid waste contractors. Whereas people of Nima pay illegal fees before disposal, people of Alajo dispose their waste without cost. Yet pollution is pervasive in both communities. This is a case where pollution may not necessarily be attributed to the cost of disposal.

Prior to the involvement of formal collectors, which are licensed by the city authority to collect waste, people depended on the informal collectors in Abelemkpe, Dzorwulu and Kokomlemlle (as mentioned above). Today, the informal service providers are found in many parts of Accra where they also offer house-to-house services to households.

Across the communities, especially in locations where there is city funded solid waste collection services, people shared the view that it needs improvement. Formal collection is making some impact in the city, yet in many communities, there is the need for efficiency in the collection system. The city authority is aware that illegal fees are paid in some of the communities. This calls for action by the city authority so that the vulnerable are not excluded.

5.2.5 Environment and Community Governance

Theme: **Environmental Quality Change and Community Governance**

The theme **environmental quality change** is defined by the concepts: *wastewater channel design, wastewater channel construction and maintenance* and *local flooding after rains*. These emerged from focus group discussions in some of the communities.

The peri-urban areas, including Abokobi-Pantang and Agbogba, offer space for containing Accra's expanding population. The challenge however, is the loss of vegetation through housing and estate developments. Waste discharge into the environment is gradually rising and therefore threatens pristine ecosystems in and along the river course. Individuals are conscious of the environmental consequences of specific practices. There are concerns that if efforts are not put in place to manage urbanisation in the peri-urban communities, water and environmental pollution will soon reach the levels observed presently in Accra.

In Alajo, concerns were raised to the effect that wastewater channel designs are substandard and not well maintained, resulting in local flooding in the communities. Other communities experiencing local flooding include North Industrial Area. This observation is common in other parts of the city. The wastewater channels require upgrading and reconstruction to function as intended. At Agbogba, the involvement of the district assembly in the maintenance of the river was raised in the focus groups and it was explained that the district assembly ensures regular dredging of the river course to allow free flow of the water to mitigate against any local flooding.

The theme: **community governance**, defined by the concepts; *community participation in water and environmental pollution control /community mobilization and knowledge sharing for capacity development; traditional authority not known/ uncooperative and hostile attitude of polluters discourages community patriots*, were generated from discussions in separate focus groups.

In Abokobi-Pantang, individuals have a role to play in efforts to control water and environmental pollution. People recognise the efforts of local leadership to ensure water and environmental protection and pollution prevention. A recognised and legitimate leadership can encourage the community to adopt pro-environmental attitudes and practices, the absence of which creates problems. The existing chieftaincy dispute in sections of Abokobi-Pantang for instance, is believed to have affected local leadership operations. Consequently, there appears to be a gradual weakening of protection for the Odaw-Korle River and the ponds systems. In a community where there used to be strict enforcement of traditional conservation practices (such as removal of foot wear before getting to the water source, a ban on walking into the water source or bathing directly in it, a ban on washing in, or near the water source, prohibition of waste dumps near the

water source), weakened local leadership will make it difficult to continue with such protective practices. If these leadership problems are resolved it could help to promote community mobilization and knowledge sharing for capacity development.

Group discussions in Agbogba, explained the fact that the traditional authority in the form of the chieftaincy has no influence on the community (*traditional authority not known*):

'I am not aware of any traditional rules on water conservation because the chief's residence is far away' (women's focus group discussion).

This applies to the other communities where traditional authorities are not known or do not exist, with the exception of North Industrial Area.

The notion that *active city participation in the enforcement of laws on sanitation and environmental pollution control engenders behaviour change*, was generated from focus group discussions in Abelemkpe. In Abelemkpe, residents have observed that when polluters receive no caution or summons from the city authority, they continue with their practices and behaviour. This makes it difficult for concerned residents to talk about it. The situation could become worse when polluters threaten residents, causing them to keep quiet.

In Kokomlemlle, people who are engaged in behaviour which leads to water and environmental pollution tend to be uncooperative and hostile to community members who take it upon themselves to approach and appeal to their conscience to change from such behaviour. The people who are prepared to intervene, who can be called 'community patriots' (personal designation) are met with strong opposition and threats from polluters.

'In the night people line up along drains and defecate. These people are drug users, and once you confront them, they ask 'is this place your mother's room or your room'. 'I was insulted for confronting someone disposing solid waste into the environment so I kept quiet' (mixed, women's and men's focus groups, Kokomlemlle).

As these threats continue, if there is no higher intervention to stop them, people are compelled not to take active part in addressing community water and environmental problems and therefore leave the situation as it is. In the worst case scenario, which is not yet the case in this community because of the socio-economic status of people living

here (chapter 4; section 4.4.3; Figure 4.41), the number of polluters could increase from within and outside as people realize that there are no punitive measures to deal with polluters.

In Nima, additional explanations relating to the perception of water and environmental quality are also grounded in the current efforts from community members to keep the community clean. Though there is pollution at the moment, certain residential and social associations [watchdog committees] are able to mobilize themselves to engage in clean-up exercises and communal labour. This is carried out sometimes in collaboration with the city authority. This is the current hope in the community and will be discussed further below when considering ways of influencing current behaviour leading to pollution. What worsens the current problems is that the polluters in the community are uncooperative and hostile to ‘community patriots’. This behaviour shuts people off and discourages them from talking about it. They put up with the situation as it gets worse. So it is not the case that people do not see any problem or are not wishing for a solution, but some have simply more or less withdrawn from active intervention as indicated in the situation of Kokomlemle, with the difference being that pollution in Kokomlemle is on a smaller scale.

In Alajo, though the community attempts to address the pollution problem by occasionally organizing its members and engaging them in communal labour to clean up, the level of cooperation has not been encouraging due to lack of leadership and a sense of direction for the community. Unlike Nima, it appears there are not many residential and social associations. Polluters who are identified and confronted tend to be hostile to and uncooperative with the community elders (as in Nima and Kokomlemle). The above explanation also holds for Abofu where polluters fail to cooperate with community patriots.

‘If you talk about wrongs in the community, you are insulted so you keep quiet’. ‘It will be difficult for the polluting behaviour to change because people only think about themselves’ (women’s focus group discussion, Alajo).

In North Industrial Area, though the community participates in water and environmental pollution control activities, there appears to be more to be done. The local authority in the person of the chief participates by mobilizing his people for communal labour. Due to the presence of the chief and his influence, environmental pollution in the community

itself is low, but pollution concentrates in the river along the boundary of the community. In Sabon Zongo the statement by the men's focus group throws light on the uncooperative nature of polluters:

'The community elders or leaders are silent for fear of being insulted or even attacked, but we are convinced that once you talk to them they will listen'.

One of the factors underpinning existing attitudes and behaviour is the limited environmental knowledge and access to environmental education of some people. Further discussion on education is presented in section 5.3.3.

Having presented some factors which influence people's actions in the communities, the next section discusses how these actions can be influenced such that water and environment will be preserved to ensure a clean and a healthy city.

5.3. CHANGING OR INFLUENCING PERCEPTION, ATTITUDES, BEHAVIOUR, AND PRACTICES LEADING TO WATER AND ENVIRONMENTAL POLLUTION

This section discusses themes and concepts which emerged from the separate focus groups in relation to how water and environmental problems in the city and its peri-urban communities could be addressed. It also incorporates results of the household interviews on attitudes. The concepts and themes referred to here were distilled from the focus group discussions using the approach discussed above.

5.3.1. Improving Access to Sanitation and Solid Waste Management

The above theme, defined by the concepts: *promoting efficient and user friendly formal and informal solid waste collection services to control pollution; promoting active city authority participation in the enforcement of laws on sanitation and environmental pollution control engenders behaviour change* were generated from separate focus group discussions in the communities.

5.3.1.1 Improving solid waste collection services

Concept: *Promoting efficient and user friendly formal and informal solid waste collection services to control pollution*

According to informants in discussions in Abelemkpe, Dzorwulu, and Kokomlemle, interventions could target the individual, community and the city in order to influence

people's environmental behaviour. Efficient collection of solid waste is important in all communities, though the situation in these three communities is commendable. The city authority has to ensure that licensed solid waste collection companies are operating in line with agreed standards in all communities. Households which cannot afford private formal solid waste collection services, use alternatives. In relation to cost of solid waste collection and disposal services, there appears to be some support for free collection and disposal services where the cost would be borne by the city authority, as indicated by the high agreement on the attitude statement in Table 5.9.

Support for such an initiative was relatively lower in Abokobi-Pantang (50%), Agbogba (26.2%), and Nima (44.3%). In the case of Abokobi-Pantang there is no public or private collection of solid waste, but there may be some level of private service at Agbogba. Though residents of Nima are not supposed to pay, currently they do pay and this, some felt, should be completely stopped. In Abelemkpe, Dzorwulu and Kokomlemle, there was no consensus on the need to introduce a system where solid waste collection bins are placed at central locations although the majority of respondents in these communities agreed with the attitude statement in Table 5.9

'The waste management company should collect the waste without cost' (mixed focus group, Abelemkpe). *'If the government pays, it will be difficult to manage, it will not be effective'* (young adults' focus group, Abelemkpe).

Table 5.9: 'Cost of solid waste disposal should be borne by the state to enhance access to disposal services'

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	50 (20)	22.5 (9)	27.5 (11)	40
Agbogba [P]	26.2 (11)	16.7(7)	57.1 (24)	42
Abelemkpe [H]	64.1(25)	7.7(3)	28.2(11)	39
Dzorwulu[H]	60(24)	2.5(1)	33(15)	40
Kokomlemle [H]	67.4(29)	7(3)	25.6(11)	43
Nima [M]	44.3(31)	1.4(1)	54.3(38)	70
Alajo[M]	81(34)	7.1(3)	11.9(5)	42
Abofu[L]	72.7(32)	2.3(1)	25(11)	44
North Industrial Area [L]	82.5(33)	2.5(1)	15(6)	40
Sabon Zongo [L]	72.1(31)	9.3(4)	18.6(8)	43
Total sample	60.9 (270)	7.4(33)	31.7 (140)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There was a statistically significant difference in the responses of the sexes (χ^2 , 2df=11.133, P=0.003824) independent of community in Table 5.9. A greater proportion of female (66.6%) than male (50.3) respondents agreed. Women usually perform the role of ensuring that solid waste is collected or sent to the bin. There were statistically highly significant differences in the responses between communities (χ^2 , 18df=86.403, P=6.348e-11) independent of sex of respondent (Table 5.9). Thus, the differences between the communities are important.

Observations and interactions in the field revealed inefficiencies in the collection system. In particular, one area that has to be considered in solid waste collection efforts is the irregularity in the collection and disposal process. Since a greater portion of household waste in Accra is organic (55%) (Drechsel and Kunze, 2001), the longer full bins remain at their locations the more they become a nuisance and a health risk to the public. This could be an indication that licensed public solid waste contractors lack the capacity for efficient service delivery.

'There is the need to increase the waste collection bins in the community'. 'The contractor should increase the cars used in collecting the waste' (mixed group, supported by similar statements in men's, women's and young adults' focus groups, Abofu).

According to informants, not all informal collectors pollute and therefore a possible strategy would be to encourage capacity development for this group and allow them to support solid waste collection in the city.

5.3.1.2 Enforcement of laws on sanitation and environment

Concept: Promoting active city authority participation in the enforcement of laws on sanitation and environmental pollution control engenders behaviour change

Access to in-house or public toilets presents opportunities to control behaviour such as inappropriate disposal of human waste into the environment and open defecation. According to informants, the district assembly could partner with communities to ensure that property owners construct these facilities in their houses. Appropriate toilet technologies could be recommended to property owners in the peri-urban communities.

‘For some people, their location is such that there is no space for a toilet; so the public one will benefit some people and the in-house ones, some people’ (men’s focus group, Abokobi-Pantang). *‘There is the need to construct public toilets and position solid waste bins so that once they are full, they are taken away’* (young adults’ focus group discussions, Abokobi-Pantang).

There appears to be a general perception in the communities that arrest and prosecution of polluters would help solve the problem as demonstrated by the high level of agreement with the attitude statement in relation to arrest and prosecution of polluters (Table 5.10).

Table 5.10: ‘Arresting and prosecuting or imposing fines on polluters can help to reduce the water pollution’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	90 (36)	7.5 (3)	2.5 (1)	40
Agbogba [P]	88.1 (37)	9.5 (4)	2.4 (1)	42
Abelemkpe [H]	76.9 (30)	17.9 (7)	5.1 (2)	39
Dzorwulu[H]	77.5 (31)	22.5 (9)	-	40
Kokomlemle [H]	90.7 (39)	2.3(1)	7 (3)	43
Nima [M]	98.6 (69)	-	1.4 (1)	70
Alajo[M]	92.9 (39)	2.4 (1)	4.8 (2)	42
Abofu[L]	97.7 (43)	2.3 (1)	-	44
North Industrial Area [L]	92.5 (37)	5 (2)	2.5 (1)	40
Sabon Zongo [L]	93 (40)	4.7 (2)	2.3 (1)	43
Total sample	90.5 (401)	6.8(30)	2.7(12)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

‘Unless there is a group similar to the AMA representatives which in the past went round to summon people who did not observe the right household sanitation practices, people may not change, but if you arrest someone, people may change’. *‘Unless people are compelled to act, they will not’*. *‘I wish the AMA representatives will come and summon people’*. *‘I think is because they are not around that is why people are polluting’* (All four discussion groups, Kokomlemle).

There were statistically significant differences in the responses between communities (χ^2 , 18df=40.255, P=0.001926) independent of sex of respondents in Table 5.10. Thus, the differences between the communities are important considerations. Interaction with the communities showed that people in Abelemkpe, Dzorwulu, and Kokomlemle did

not favour the construction of a public toilet in the communities because of their status as indicated above [as places dominated by the rich; section 4.4.3].

‘There are no public toilets for visitors’. The nature of Abelemkpe does not warrant a public toilet’ (young adults’ focus group, Abelemkpe).

However, there is a privately owned public toilet which serves people lacking in-house toilets or visitors in Kokomlemle. It is a small one in comparison to what is common in the city; people did not anticipate any additional public toilets in Kokomlemle. Aside from the support for arrest and prosecution, the communities recognize that it is an enormous task to actually operationalise this because of the secret activities of polluters. This is depicted by the high level of agreement with the attitude statement on Table 5.11 below.

In Nima and Alajo, and Abofu, North Industrial Area and Sabon Zongo, there is high demand for public toilets due to inadequate in-house toilets (section 5.2.1). Therefore as part of supporting people to change their behaviour, attention needs to be given to the provision of these services in the above communities.

Table 5.11: ‘It is difficult to arrest and prosecute polluters because acts are done in secret’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	67.5 (27)	10 (4)	22.5 (9)	40
Agbogba [P]	90.5 (38)	7.1 (3)	2.4 (1)	42
Abelemkpe [H]	79.5 (31)	15.4 (6)	5.1 (2)	39
Dzorwulu[H]	81.6 (31)	18.4 (7)	-	38
Kokomlemle [H]	81.4 (35)	4.7 (2)	14 (6)	43
Nima [M]	90 (63)	1.4(1)	8.5 (6)	70
Alajo[M]	83.3 (35)	7.1 (3)	9.5 (4)	42
Abofu[L]	93.2 (41)	-	6.8 (3)	44
North Industrial Area [L]	87.5 (35)	7.5 (3)	5 (2)	40
Sabon Zongo [L]	69.8 (30)		30.2 (13)	43
Total sample	83 (366)	6.6 (29)	10.4 (46)	441

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically high significant differences in the responses between communities (χ^2 , 18df=62.756, P=7.284e-07) independent of sex of respondent in Table 5.11. This makes the differences between communities worth considering in interventions.

In spite of the difficulty in relation to arrest and prosecution of polluters, people expressed their views on the need to enforce the laws on sanitation. However, this should go together with provision of facilities.

'There should be implementation or enforcement of laws on sanitation and waste management' (men's focus group, Alajo).

'The AMA should ensure that each house has a toilet' (young adults' focus group discussion) (see also Box 5.1).

'There should be the provision of sufficient facilities and then culprits (of pollution) should be arrested' (mixed focus group, North Industrial Area).

It will be difficult for people to change if no security is put in place to arrest culprits and prosecute them' (mixed focus group discussion, supported by similar statements in women's focus group, Dzorwulu).

Box 5.1 Access to Toilets

In a recent survey by the Accra Metropolitan Assembly (AMA), published by the Ghanaian Daily Graphic (Saturday, January 15, 2011), it was reported that 'ninety-one per cent (91%) of all dwelling units in the national capital are without private places of convenience. The startling figures released by the Public Health Unit of the assembly also revealed that the situation had created a heavy dependence on public toilets and unapproved places for the disposal of human waste in the city. In real figures, 114, 521 residences are without toilets, with 9,149 and 1,842 houses using water closets (WCs) and the Kumasi Ventilated Improved Pits (KVIPs), respectively. A total of 315 houses are also using the outlawed pan latrines, with some 79 homes also using pit latrines. This has created a situation where residents depend heavily on public toilets, which are also described as inadequate. Consequently, the AMA has embarked on a month-long house-to-house inspection exercise to serve notices to those houses without the facilities and the owners are expected to provide the facilities by the end of September, 2011'.

(Source: www.myjoyonline.com; January 15, 2011)

Current perception also indicates that the city authority can do more in law enforcement. This is shown by the almost 50% agreement in communities in relation to whether city authorities enforce regulations (with the exception of Nima which was extremely low, 27.1 %, Table 5.12). Nima showed high disagreement with the attitude statement, implying that laws on sanitation and the environment are *not* enforced. This is explained by the current state of pollution and problems over accessing sanitation and solid waste

management services in Nima. There were statistically highly significant differences in the responses between communities (χ^2 , 18df=74.508, P=7.688e-09) independent of sex of respondent in Table 5.12.

Table 5.12: ‘There is enforcement of regulations on environmental sanitation and solid waste management by city authorities’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	40 (16)	17.5 (7)	42.5(17)	40
Agbogba [P]	50 (21)	9.5 (4)	40.5 (17)	42
Abelemkpe [H]	64.1 (25)	17.9(7)	17.9 (7)	39
Dzorwulu[H]	40 (16)	27.5(11)	32.5 (13)	40
Kokomlemle [H]	51.2 (22)	11.6(5)	37.2 (16)	43
Nima [M]	27.1 (19)	-	72.9 (51)	70
Alajo[M]	59.5 (25)	4.8 (2)	35.7 (15)	42
Abofu[L]	70.5 (31)	13.6(6)	15.9 (7)	44
North Industrial Area [L]	50 (20)	7.5(3)	42.5 (17)	40
Sabon Zongo [L]	53.5 (23)	11.6 (5)	34.9 (15)	43
Total sample	49.2(218)	11.3(50)	39.5(175)	443

In relation to whether the AMA is concerned about the Odaw-River, the majority of people were either uncertain about, or disagreed with the attitude statement in Table 5.13. This supports the high expectation by residents across the city that the city authority has to do more to protect and preserve the water resource. That is considered an important component in behaviour change in communities of Accra.

Table 5.13: ‘The AMA [or district assembly] is concerned with the quality of the river [water]’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	27.5(11)	35 (14)	37.5 (15)	40
Agbogba [P]	4.8 (2)	42.9 (18)	52.4 (22)	42
Abelemkpe [H]	41(16)	30.8 (12)	28.2 (11)	39
Dzorwulu[H]	32.8(23)	20 (8)	47.5 (19)	40
Kokomlemle [H]	35.7(15)	9.3 (4)	46.5 (20)	43
Nima [M]	44.2(19)	2.9 (2)	64.3 (45)	70
Alajo[M]	32.5(13)	26.2 (11)	38.1 (16)	42
Abofu[L]	29.5(13)	38.6 (17)	31.8 (14)	44
North Industrial Area [L]	32.5(13)	20(8)	47.5(19)	40
Sabon Zongo [L]	46.5(20)	23.3(10)	30.2 (13)	43
Total sample	32.8(145)	23.5(104)	43.8 (194)	443

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=72.09, P=1.995e-08) independent of sex of respondent in Table 5.13.

A law enforcement officer could be physically threatened by polluters. In Nima for instance, the perception is that polluters are in general lawless individuals within the community.

‘Some Nima people are stubborn’. ‘They do not fear the police’. ‘The AMA can help but they may be beaten up by the people’. ‘We need to be strong in controlling behaviour’. ‘Once you arrest people, they will blame the government that, since it was elected, it has done this and that’ (women’s focus group, Nima).

‘To change behaviour; there is the need for some level of force to be applied’ (mixed focus group, Nima).

‘In Nima; if you do not say that you will arrest, the people will not stop’. ‘People do not learn from experience’. ‘The law enforcement should work and the law on cleanliness should be applied’ (young adults’ focus group, Nima).

There is a perception in the city that selfishness will make it difficult for people to change their behaviour. This is supported by the high agreement with the attitude statement in Table 5.14. The perception is that acts of pollution are themselves selfish

deeds. However, this does not imply that the community members would not respond to calls on attitude and behaviour change.

Table 5.14: ‘Selfishness will make it difficult for people to change their behaviour’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	67.5 (27)	7.5 (3)	25 (10)	40
Agbogba [P]	73.8 (31)	14.3 (6)	11.9 (5)	42
Abelemkpe [H]	71.8 (28)	12.8 (5)	15.4 (6)	39
Dzorwulu[H]	80 (32)	15 (6)	5 (2)	40
Kokomlemle [H]	53.5 (23)	14 (6)	32.6 (14)	43
Nima [M]	78.5 (55)	1.4(1)	20 (14)	70
Alajo[M]	85.4 (35)	14.6 (6)	-	41
Abofu[L]	72.1 (31)	11.6 (5)	16.3 (7)	43
North Industrial Area [L]	80 (32)	17.5 (7)	2.5 (1)	40
Sabon Zongo [L]	86 (37)	2.3 (1)	11.6 (5)	43
Total sample	75.1(331)	10.4(46)	14.5(64)	441

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=49.591, P=8.7e-05) independent of sex of respondent in Table 5.14. Thus, the differences between the communities are important.

5.3.2. Urbanization and Planning

The above theme, defined by the concepts: *responding to urbanization through effective planning and designing, constructing and maintaining channels to control run-off and wastewater flow* were generated from focus group discussions in some of the communities.

Discussions on urbanisation and planning recognized the enormous effect they have on the socio-economic, political and the ecological processes of communities.

‘The influence of urbanization makes control [of water and environmental resources] difficult’. ‘The population has increased, you do not know who is who, and the supervision is difficult’ (mixed focus group, Abokobi-Pantang).

The transition from rural to urban, needs to be managed appropriately so that vital resources are not lost because of people's behaviour. Population rise results in new challenges in relation to control and management of resources and therefore calls for proactive and innovative strategies. For example, a section of Abokobi-Pantang is yet to resolve a chieftaincy dispute. According to informants in the focus group discussions at Abokobi-Pantang, district authority-community collaboration can promote a form of participatory conflict resolution within the community. Ecological approaches to resource conservation should be considered where the district and the community share a unique opportunity to ensure that developments follow planning lay outs for the community such that sections marked as green are adequately protected.

'We should plant bamboos to fence the river to restrain the livestock' [from polluting it] (men's focus group discussion supported by a similar statement by women's focus group).

Women contemplated setting up an informal group to oversee water conservation in Abokobi-Pantang:

'The women should take up the task of conserving the water body since we are mostly in charge of fetching and using water for various activities' (women's focus group, Abokobi-Pantang).

In Nima and Sabon Zongo, focus groups expressed the view that community infrastructure planning promotes water and environmental pollution control. People's explanations showed that when communities are disorganized, certain attitudes, behaviours and practices tend to be common in such areas. This was supported by the high agreement on the attitude statement across all the selected communities in the city (Table 5.15). There was statistically significant difference in the responses of the sexes (χ^2 , 2df=6.7587, P=0.03407) independent of community in Table 5.15, such that a slightly higher proportion of male (85.5) than female (79.9%) respondents agreed. There were statistically significant differences in the responses between communities (χ^2 , 18df=36.641, P=0.005834) independent of sex of respondent in Table 5.15. Therefore the different communities are important for consideration.

Table 5.15: ‘Lack of neighbourhood planning contributes to behaviour that pollutes the river [water]’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	77.5 (31)	15 (6)	7.5 (3)	40
Agbogba [P]	61.9 (26)	31 (13)	7.1 (3)	42
Abelemkpe [H]	79.5 (31)	15.4 (6)	5.1 (2)	39
Dzorwulu[H]	81.6 (31)	15.8 (6)	2.6 (1)	38
Kokomlemlle [H]	88.1 (37)	4.8 (2)	7.1 (3)	42
Nima [M]	90 (63)	2.9 (2)	7.1(5)	70
Alajo[M]	85.7 (36)	11.9 (5)	2.4 (1)	42
Abofu[L]	81.8 (36)	18.2 (8)	-	44
North Industrial Area [L]	84.6 (33)	10.3 (4)	5.1 (2)	39
Sabon Zongo [L]	93.0 (40)	2.3 (1)	4.7(2)	43
Total sample	82.9 (364)	12.1(53)	5(22)	439

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

In Agbogba, focus group discussions suggested the need to design, construct and maintain channels to control run-off and wastewater flow. Similar problems relating to wastewater flow channels were observed in Alajo, Abofu and indeed many parts of the city. In the case of Alajo, Nima, North Industrial Area, and Sabon Zongo, large sections of the communities are without wastewater channels and this poses health risks from haphazard disposal of wastewater. Many of the wastewater channels in the city fail to allow wastewater to flow due to inefficient engineering designs (personal observation) and therefore this suggestion is relevant for the entire city.

5.3.3. Improving Community Governance

The above theme was defined by the following concepts which were generated from separate focus group discussions in the communities.

- *Promoting community participation and initiatives in water and environmental resource management and pollution control (with related issues: resource use conflict resolution; empowering women for resource conservation)*
- *Creating awareness and educating community members for water and environmental pollution control (with related issues: responding to open and*

hidden behaviour, practices and patterns of solid and human waste disposal leading to water and environmental pollution; educating and creating awareness through demonstrations to promote pro-environment behaviour)

- *Promoting a common vision among community members will engender community participation in interventions*

These concepts are elaborated below.

5.3.3.1. Community participation in environmental management

Concept: *Promoting community participation and initiatives in water and environmental resource management and pollution control*

In Abokobi-Pantang, focus group discussion suggested the need for conflict resolution in resource use and the need for women to be empowered to participate in resource conservation. There can be conflicts in the use of water and land resources. If some uses serve as sources of pollution to the community they can lead to conflicts between community members. Livestock keeping could conflict with domestic uses of surface water. In order to protect the resources and to ensure a sustainable use, the peri-urban communities, such as Abokobi-Pantang must encourage local participation to promote pro-environment behaviour. Recognised leadership is required to manage the problems of resource use conflicts.

'The community's traditional rules are no longer effective as in the past'. There used to be communal labour in the past but not today'. 'Communal labour is important' [and therefore should be revived] (men's, women's, and mixed focus group, Abokobi-Pantang).

Therefore measures have to be put in to respond to observed conflicts between community members and livestock owners in relation to the use of community water ponds. A functional leadership can promote community adapted solutions to water and environmental management. Traditional conservation methods could also be considered.

In Agbogba, it was noted that water tanker drivers wash their vehicles at the banks of the river, in the course of which petroleum wastes and sand are carried from the truck to the river. Thus, resource use conflict resolution is also relevant because the community is one of the locations where surface water is accessed for various use in the peri-urban communities. Community leadership should collaborate with the district assembly to respond to problems and disputes relating to water and environmental resources use.

'Since drivers have refused to listen to the opinion of the community members, there should be dialogue between the city council and drivers'. 'A sign post should be placed near the river, warning drivers to desist from washing vehicles at the banks of the river' (men's focus group, Agbogba).

In Abelemkpe and Kokomlele, discussion on *community participation and initiatives in water and environmental pollution control* suggested the need for communities to identify innovative approaches to respond to problems. One form that this has taken in the community and other parts of the city has been through the activities of community watchdog committees. In Abelemkpe, the community representative at the AMA is known to be active in mobilizing the community for clean-up exercises. The watchdog committee or community associations could encourage individual responsibility and vigilance on the environment.

'I think there is the need to organize regular clean-up exercises, which are practised in the community currently' (men's focus group, Abelemkpe).

'A special task force would help in creating awareness to scare away perpetrators [of pollution] for instance' (mixed focus group, Abelemkpe). 'Every individual should be influential in his/her own way, if you do not do it [pollute] and you find someone doing it [polluting] tell him or her' [to stop] (young adults' focus group, Abelemkpe).

In the case of Nima, informants suggested the need for an initiative that will ensure that existing watchdog committees are strengthened. The positive side of these suggestions are that, in the communities, not all people engage in actions which lead to pollution and many people wish the problems were solved or were addressed, but lack of leadership has been a major challenge.

In the case of Nima, there was evidence (observed during field work, discussed in focus groups) that the community contributes greatly to the environmental pollution load (discussed in section 5.2.1-5.2.4). Since polluters are uncooperative, some shared the view that spiritual leaders have to be involved (Table 5.16).

Table 5.16: ‘Spiritual leaders can help to change people’s behaviour’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	82.5 (33)	5 (2)	12.5 (5)	40
Agbogba [P]	95.2 (40)	4.8 (2)	-	42
Abelemkpe [H]	74.4 (29)	12.8 (5)	12.8 (5)	39
Dzorwulu[H]	85 (34)	12.5 (5)	2.5 (1)	40
Kokomlemle [H]	69.7 (30)	7 (3)	23.3 (10)	43
Nima [M]	80 (56)	1.4 (1)	18.6 (13)	70
Alajo[M]	76.2 (32)	14.3 (6)	9.5 (4)	42
Abofu[L]	81.4 (35)	4.7 (2)	14 (6)	43
North Industrial Area [L]	70 (28)	10 (4)	20 (8)	40
Sabon Zongo [L]	78.6 (33)	-	21.4 (9)	42
Total sample	79.3 (345)	6.8(30)	13.8 (61)	441

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

In addition to Nima, the other communities equally showed high agreement with the attitude statement that spiritual leaders can help to change people’s behaviour (Table 5.16). There were statistically highly significant differences in the responses between communities (χ^2 , 18df=43.661, P=6.448e-04) independent of sex of respondent in Table 5.16. Therefore the differences between communities are worthy of attention in interventions.

In Abofu, North Industrial Area and Sabon Zongo, various aspects of community mobilisation and empowerment emerged from discussions. In Abofu and North Industrial Area, behaviour change relates to promoting community participation and initiatives on water and environmental pollution control (as discussed above). The communities desire to have a clean environment and therefore city-community participation will ensure, for instance, that wastewater channels in the communities are kept clean through community lead clean-up activities.

Together with the representative of the communities at the city level (commonly called assembly member), the city authority should identify young adult leaders, community opinion leaders (Table 5.17) and selected educated people to develop their capacity so they can support community teams or groups to offer leadership to the rest of the

community. This is supported by the high agreement by respondents in Table 5.17. There were statistically highly significant differences in the responses between communities (χ^2 , 18df=50.144, P=7.179e-05) independent of sex of respondent in Table 5.17. Consequently, the uniqueness of the communities should be factored into interventions.

Table 5.17: ‘Community champions [opinion leaders] can help change behaviour’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	87.5 (35)	7.5 (3)	5 (2)	40
Agbogba [P]	92.9 (39)	7.1 (3)	-	42
Abelemkpe [H]	76.9 (30)	12.8 (5)	10.3 (4)	39
Dzorwulu[H]	84.6 (33)	15.4 (6)	-	39
Kokomlemle [H]	81.4 (35)	2.3 (1)	16.3 (7)	43
Nima [M]	81.4 (57)	1.4(1)	17.1 (12)	70
Alajo[M]	68.3 (28)	19.5(8)	12.2 (5)	41
Abofu[L]	76.7 (33)	11.6 (5)	11.6 (5)	43
North Industrial Area [L]	70 (28)	7.5 (3)	22.5 (9)	40
Sabon Zongo [L]	79.1 (34)	2.3 (1)	18.6 (8)	43
Total sample	80 (352)	8.2(36)	11.8(52)	440

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

A community team that is functional can help to monitor solid waste collection and disposal in the communities and offer some advice to both the city authority and individuals on pollution control. Though community representatives [Assembly members] at the city or district level are expected to have good working relationships with the community, responses to the attitude statement in Table 5.18 indicate that communities in the peri-urban areas experience very limited contributions from the elected representative to the district assembly in relation to issues on surface water, but not necessarily all community environmental concerns.

There was low agreement with the attitude statement in Dzorwulu and Kokomlemle (Table 5.18). Agreement was also low in Nima (38.6%) and Alajo (31.7%). Abofu and North Industrial Area had close to half of respondents in agreement, while Sabon Zongo recorded the highest agreement (71.4%). Though the attitude statement (Table 5.18) was

in reference to the river, interaction with community members in Abelemkpe, Dzorwulu, Nima, Abofu, North Industrial Area, and Sabon Zongo indicated that the Assembly members are doing well in terms of community mobilization for clean-up activities.

Table 5.18: ‘The Assembly man or woman represents community concerns on Odaw River [water] quality at the Assembly’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	30 (12)	27.5 (11)	42.5 (17)	40
Agbogba [P]	4.8 (2)	42.9 (18)	52.4 (22)	42
Abelemkpe [H]	46.2 (18)	38.5 (15)	15.4 (6)	39
Dzorwulu[H]	35 (14)	25 (10)	40 (16)	40
Kokomlele [H]	32.6 (14)	9.3 (4)	58.1 (25)	43
Nima [M]	38.6 (27)	4.3 (3)	57.1 (40)	70
Alajo[M]	31.7 (13)	24.4 (10)	43.9 (18)	41
Abofu[L]	43.2 (19)	31.8 (14)	25 (11)	44
North Industrial Area [L]	45 (18)	7.5 (3)	47.5 (19)	40
Sabon Zongo [L]	71.4 (30)	4.8 (2)	23.8 (10)	42
Total sample	37.9(167)	20.4(90)	41.7(184)	441

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

However, the fact still remains that the assembly members have to be encouraged to participate more in the activities of community watchdog committees. It should be noted that Nima is a place where ‘the river is considered as wastewater (as discussed above) and therefore referred to as a drain (or wastewater channel). This probably creates the notion that there is nothing for the assembly man to report apart from addressing issues of further environmental pollution. Interactions showed that the communities are willing to have a close relationship with the city authority to promote pro-environmental attitudes and behaviour. Therefore, the community will cooperate with the city authority to address the current challenges.

The community will respond to a call on behaviour change’. ‘If the AMA officials come they will be listened to because they are known to be government officials and can cause arrest of people’. ‘The community is likely to listen to strangers or people coming from outside the community’ (mixed focus group, Sabon Zongo).

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=100.66, P=1.68e-13) independent of sex of respondent in Table 5.18. Therefore in locations where the influence of the assembly member is low, this must be improved.

5.3.3.2 Awareness creation and water and environmental management

Concept: *Creating awareness and educating community members for water and environmental pollution control (or to promote pro-environment behaviour)*

The city authority (after supporting or identifying community watchdog committees discussed in section 5.3.3.1) could then liaise with such community based groups to carry out joint educational campaigns (Table 5.19) on water and environmental management. This will help communities to be aware of existing campaigns. In Agbogba, the total uncertainty (42.9 %) was higher than agreement and disagreement on the attitude statement in Table 5.19, an indication of a need to strengthen options on environmental education as well. In all the other communities, the total respondents who agreed to the attitude statement were higher than those who were uncertain or disagreed. A look at the figures in Table 5.19 indicates that the total respondents who agreed in each community is about 50%, apart from Dzorwulu and Abokobi-Pantang which were higher.

Table 5.19: ‘I am aware of campaigns on water pollution control’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	61.1 (22)	8.3 (3)	30.6 (11)	36
Agbogba [P]	33.4 (14)	42.9 (18)	23.8 (10)	42
Abelemkpe [H]	54.3 (19)	34.3 (12)	11.4 (4)	35
Dzorwulu[H]	71.1 (27)	7.9 (3)	21.1 (8)	38
Kokomlemle [H]	56.1 (23)	22 (9)	22 (9)	41
Nima [M]	54.4 (37)	7.4 (5)	38.2 (26)	68
Alajo[M]	55 (22)	30 (12)	15 (6)	40
Abofu[L]	51.2 (22)	27.9 (12)	20.9 (9)	43
North Industrial Area [L]	47.5 (19)	20 (8)	32.5 (13)	40
Sabon Zongo [L]	48.8 (21)	7 (3)	44.2 (19)	43
Total sample	53(226)	20(85)	115(27)	426

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=43.656, P=6.46e-04) independent of sex of respondents in Table 5.19. Thus, the differences between the communities are important for future intervention.

In the process of education and awareness creation, specific attitudes or behaviours identified by the community as leading to environmental pollution can be addressed through customised programmes. Community responses in Table 5.20 show high agreement with the attitude statement that a special community task force would be able to help to address water and environmental pollution. This shows the support that communities are possibly willing to offer to such a team. The responses relating to the attitude statement (Table 5.20) reflects the general opinion obtained from interaction with the communities that a special community task force would be able to help change people's environmental attitudes and behaviour.

Table 5.20: 'A special community task force would be able to help in creating awareness on pollution control'

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	87.2 (34)	5.1 (2)	7.7 (3)	39
Agbogba [P]	92.9 (39)	7.1 (3)	-	42
Abelemkpe [H]	84.2 (32)	13.2 (5)	2.6 (1)	38
Dzorwulu[H]	84.2 (32)	10.5 (4)	5.3 (2)	38
Kokomlemle [H]	93 (40)	2.3 (1)	4.7 (2)	43
Nima [M]	97.1 (68)	-	2.9 (2)	70
Alajo[M]	95.2 (40)	2.4 (1)	2.4 (1)	42
Abofu[L]	93.2 (41)	2.3 (1)	4.5 (2)	44
North Industrial Area [L]	95 (38)	2.5 (1)	2.5 (1)	40
Sabon Zongo [L]	93 (40)	2.3 (1)	4.6 (2)	43
Total sample	92(403)	4.3(19)	3.6(16)	439

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

Awareness creation on pollution control is against the backdrop that respondents showed high agreement on the attitude statement: 'community members can be persuaded to change their behaviour (Table 5.21).

Table 5.21: ‘Community members can be persuaded to change their behaviour’

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	90 (36)	2.5 (1)	7.5 (3)	40
Agbogba [P]	83.3 (35)	11.9 (5)	4.8 (2)	42
Abelemkpe [H]	76.9 (30)	15.4 (6)	7.7 (3)	39
Dzorwulu[H]	78.9 (30)	18.4 (7)	2.6 (1)	38
Kokomlemle [H]	67.4 (29)	7 (3)	25.6 (11)	43
Nima [M]	47.1 (33)	2.9 (2)	50 (35)	70
Alajo[M]	57.1 (24)	19 (8)	23.8 (10)	42
Abofu[L]	67.4 (29)	20.9 (9)	11.6 (5)	43
North Industrial Area [L]	61.5(24)	15.4(6)	23.1(9)	39
Sabon Zongo [L]	65.1(28)	4.7 (2)	30.2 (13)	43
Total sample	67.9(298)	11.2(49)	20.9 (92)	439

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision;
L= Low infrastructure provision

The relatively low response of people who agreed (47.1%) (Table 5.21) in Nima could be explained by the view presented in the focus group discussion that ‘stubbornness’ is high in Nima in particular. So the level of agreement with the attitude statement reflects what also emerged from the focus group discussions in Nima.

There were statistically highly significant differences in the responses between communities (χ^2 , 18df=82.495, P=3.124e-10) independent of sex of respondent in Table 5.21. Though polluters are aware of their actions, educating and creating awareness will re-emphasize the obvious demand on polluters in the community.

‘Publicity should start with schools’. ‘Use the media’. ‘To change behaviour, there is the need for education’ (men’s and women’s focus group, Abelemkpe).

In the communities discussed above, the analysis indicated education and awareness creation as one area that should be considered to influence attitudes and behaviour (Table 5.22 and 5.23).

‘To change these practices [which lead to pollution], there should be house-to-house education and each house encouraged to have their toilet or go to the public toilet’ (young adults’ focus group, Kokomlemle).

'There is the need to educate people so that they will stop [polluting]' (mixed focused group discussion, Nima).

Table 5.22: 'Education on water quality should be carried out by the AMA'

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	72.5 (29)	17.5 (7)	10 (4)	40
Agbogba [P]	82.9 (39)	7.1 (3)	-	42
Abelemkpe [H]	74.4 (29)	15.4 (6)	10.3 (4)	39
Dzorwulu[H]	75.7 (28)	13.5 (5)	10.8 (4)	37
Kokomlemle [H]	95.3 (41)	2.3 (1)	2.3 (1)	43
Nima [M]	94.3 (66)	1.4 (1)	4.3 (3)	70
Alajo[M]	81 (34)	11.9 (5)	7.1 (3)	42
Abofu[L]	90.9 (40)	4.5 (2)	4.5 (2)	44
North Industrial Area [L]	77.5 (31)	12.5 (5)	10 (4)	40
Sabon Zongo [L]	93 (40)	4.7 (2)	2.3 (1)	43
Total sample	85.7(377)	8.4(37)	5.9(26)	440

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically significant differences in the responses between communities (χ^2 , 18df=33.897, P=0.0130) independent of sex of respondent in Table 5.22.

Table 5.23: 'Increased information and education will help to change behaviour'

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	90 (36)	5. (2)	5 (2)	40
Agbogba [P]	95.2 (40)	4.8 (2)	-	42
Abelemkpe [H]	76.3 (29)	18.4 (7)	5.3 (2)	38
Dzorwulu[H]	84.6 (33)	12.8 (5)	2.6 (1)	39
Kokomlemle [H]	90.7 (39)	2.3 (1)	7 (3)	43
Nima [M]	91.4 (64)	1.4 (1)	7.1 (5)	70
Alajo[M]	82.5 (33)	12.5 (5)	5 (2)	40
Abofu[L]	88.4 (38)	2.3 (1)	9.3 (4)	43
North Industrial Area [L]	76.9 (30)	5.1 (2)	17.9 (7)	39
Sabon Zongo [L]	86 (37)	-	14 (6)	43
Total sample	86.7(379)	5.9 (26)	7.3(32)	437

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

There were statistically significant differences in the responses between communities (χ^2 , 18df=39.029, P=0.002824) independent of sex of respondent in Table 5.23.

In Nima and Alajo, focus group discussion suggested that educating and creating awareness through demonstrations will promote pro-environmental behaviour. Demonstrations will present examples for community members to emulate and promote.

I think that to address this [pollution] there is the need for education and also demonstrations to the community on how to do the right thing (mixed focus group discussion, Nima).

Leadership by good example is also considered as important in demonstrations. If opinion leaders and community leaders will demonstrate what they promote and ensure that their households do same, then that will offer a practical demonstration of what is expected of people.

The elders should serve as role models to the community (women's focus group, North Industrial Area).

There should be education of community members through community forum. We should set up a watchdog committee in collaboration with an outsider. We can use drama to change behaviour. People should be changed psychologically (young adults', men's and women's focus group, North Industrial Area).

We need someone to control us to clean up the area; the person should understand the need to keep the community clean. I think that the community will welcome any group to teach or educate the community members (women's focus group discussion, Alajo).

It was also suggested that the approaches will consider education and awareness creation at the household level in North Industrial Area and Kokomlemlle.

5.3.3.3 Collaboration and community participation in intervention

Concept: *Promoting a common vision among community members will engender community participation in interventions*

Though people live at peace within the community, they are not together [oneness of purpose or direction] (mixed focus group, Nima).

This implies that when people in a community are unable to find common ground on specific issues and problems confronting them, it will be difficult to realize any progress in development (Table 5.24) unless a process is imposed on the community. There was a statistically significant difference in the responses of the sexes (χ^2 , 2df=7.0171, P=0.0299) independent of community for the attitude statement in Table 5.24 (frequencies of male and female not included), such that a slightly higher proportion of male (89.7%) than female (81.5%) respondents agreed. There were statistically highly significant differences in the responses between communities (χ^2 , 18df=47.099, P=2.047e-04) independent of sex of respondent in Table 5.24. Thus, differences between communities and the sexes are important.

Apart from Nima, Alajo, Abofu and Sabon Zongo where high agreement was expected, it was not expected that places such as Abelemkpe, Dzorwulu, and Kokomlemle will show high agreement because of their current high environmental quality. Perhaps it could be a sign that respondent felt that more cooperation of community members will allow more results to be achieved.

Table 5.24: ‘Lack of common purpose or unity in this community is also a factor in water pollution’.

Community	Frequency (%)			
	Agree	Uncertain	Disagree	Total response
Abokobi-Pantang [P]	82.5 (33)	2.5 (1)	15 (6)	40
Agbogba [P]	82.9 (34)	12.2 (5)	4.9 (2)	41
Abelemkpe [H]	77 (30)	17.9 (7)	5.1 (2)	39
Dzorwulu[H]	75 (30)	22.5 (9)	2.5 (1)	40
Kokomlemle [H]	67.4 (29)	9.3 (4)	23.3 (10)	43
Nima [M]	92.9 (65)	2.9 (2)	4.3 (3)	70
Alajo[M]	85.7 (36)	9.5 (4)	4.8(2)	42
Abofu[L]	84.1 (37)	11.3(5)	4.6(2)	44
North Industrial Area [L]	94.7 (36)	2.6 (1)	2.6 (1)	38
Sabon Zongo [L]	90.7 (39)	-	9.3 (4)	43
Total sample	84.3(371)	8.2(36)	7.5(33)	440

P=Peri-urban; H= High infrastructure provision; M= Medium infrastructure provision; L= Low infrastructure provision

5.3.4. Gender and Water and Environmental Management

This section briefly considers some of the concerns and the role of men and women in water and environmental management.

Men's concerns

The Men's view was that appropriate knowledge about water quality helps people to make decisions and choices for its use. They were concerned about problems of access to and the hygienic situations in public toilets. They were more likely to complain about wastewater channels in their community. Their views on pollution problems included relaxation of traditional conservation rules especially in the peri-urban communities. They were concerned about conflicts over access to water for various purposes. Since there are competing uses of water, there are bound to be conflicts. They saw themselves as pivotal in helping to resolve such conflicts.

Women's concerns

Women appeared to notice the seasonal changes in water quality, especially in the peri-urban communities where the water was used for different activities. They were also concerned about the health consequences of polluted water and environment on children and livestock. Similar to the men, they were concerned about places for solid waste disposal, especially distance to collection bins as well as the cost of disposal. However, some also send their children to dispose all forms of waste into the waste disposal bins, the river or the environment. They were equally concerned about the need for decent sanitation. They were also concerned about the role of local leadership in responding to community water and environmental problems.

Men's role in management

Men support the need to respond to the effects of urbanization and efforts made to protect the river. In order to do this, local leadership is considered important. They also support the need to enforce laws on water and environmental management. They support the need for equitable use of resources and efficient waste disposal systems. They form community watchdog committees and carry out clean-up exercises in communities. They support the need to improve sanitation and educate people on good practices.

Women's role in management

Women considered the need to take measures to protect the river. In this vein, women saw themselves as important actors in water and environmental management since it is their role to manage household water. They also had high expectation that the city authority will take steps to manage water and environmental resources. Their view was that decent sanitation will help stem pollution in the city. They shared the views of the men that there is the need for efficient waste disposal systems. They saw the need to control activities of children to prevent them from polluting and for women to also ensure that children send solid waste to designated bins in the city.

5.4 ASSOCIATION BETWEEN RESPONSE TO ATTITUDE STATEMENTS AND SELECTED SOCIO-ECONOMIC FACTORS

The attitude statements of respondents (reproduced in Table 5.25) were correlated with the following factors to test for any associations: total number of people in formal occupation of household; total number of people in informal occupation of household; socio-economic score 1; socio-economic score 2 (all chapter 4: section 4.4.3 to 4.4.4); per capita monthly household income; total household income (all chapter 4: section 4.2.2.3); age of respondent; educational status of respondent (all Appendix 3.76); and the number of years respondent has lived in the city; The test was carried out at the category of community level.

Table 5.25: Attitude statements

Question	Attitude statements
1	Uncontrolled disposal of solid and liquid waste affect the quality of the river
2	Majority of people have access to toilet
3	Open defecation into the river affects the quality of the water
4	Wrapping and disposing of individual human excreta into the river and its surrounding is common in this community
5	I am aware that there is uncontrolled disposal of human excreta from pan latrines into the Odaw River
6	The quality of the water in the city cannot improve so long as wastewater drains link to it
7	Cost of solid waste disposal is expensive and responsible for uncontrolled disposal
8	Informal solid waste collectors are part of uncontrolled disposal of solid waste into the environment
9	Cost of solid waste disposal should be borne by the state
10	Arresting and prosecuting or imposing fines on polluters can help reduce the water

	pollution
11	It is difficult to arrest and prosecute polluters because acts are done in secret
12	There is enforcement of regulations on environmental sanitation and solid waste management by city authorities
13	The AMA is concerned with the quality of the water
14	Selfishness will make it difficult for people to change their behaviour
15	Lack of neighbourhood planning contributes to behaviour that pollutes the river
16	Spiritual leaders can help to change people's behaviour
17	Community champions[opinion leaders] can help change behaviour
18	The Assembly man or woman represents community concerns on Odaw –River water quality at the District or city Assembly
19	I am aware of campaigns on water pollution control
20	A special community task force would be able to create awareness on pollution control
21	People can be persuaded to change their behaviour
22	Education on water quality should be carried out by AMA
23	Increased information and education will help to change behaviour
24	Lack of common purpose is also a factor in water pollution

Table 5.26 indicates that, apart from age, which is moderate, all the other significant correlations are weak. Socio-economic score 1 and 2 each correlated with only one attitude statement and that makes it difficult to draw conclusions. A look at question 6 (Table 5.25) also does not reveal any meaningful relationship. Similar trends were observed for the high, medium, and low infrastructure provision communities where the correlations were weak (less than 0.3) in most cases and correlating with only very few of the questions (Appendix 5.7) similar to what was observed in the peri-urban communities. Consequently, enough evidence does not exist in this study to attribute causal relationship between the responses to the attitude statements and the selected factors.

Table 5.26: Significant correlations between attitude statements and selected socio-economic factors (P<0.05) at the peri-urban communities

Q	Total formal occupation	Total informal occupation	Socio-eco 1	Socio-eco 2	Per capita household income	Income	Age	Education	Years in Accra
1							0.388		
2									
3							0.485		
4									
5									
6			0.301	0.29					
7									
8									
9									0.24
10									
11					-0.321				
12									
13						0.284			
14									
15									
16									
17									
18						0.261			
19									
20									
21									-0.224
22									
23									-0.26
24									

5.5. SUMMARY

Chapter five has presented the findings for the main research question 2: Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced? The sub-research question 2(i): What are the community criteria for and perception of surface [river] water and to what extent does it influence its use for various activities? was addressed as presented below. The five human senses play key roles in the perception of people in terms of the construct of water and environmental quality. Individuals have varied capacity to think and reflect on sensory information relating to water and environment to form perceptions. Previous knowledge or experience of any water and environment phenomenon shapes the current perception. The knowledge and experience of people could be general or unique to their specific circumstances and surrounding conditions. This enables people to decide on possible uses and benefits of the water. Concerns about health risks are raised when there is the possibility of human or livestock contact with the surface water. In this vein, references are made to vulnerable groups such as children and youth who may lack the capacity to judge potential health risks and consequences. To be able to raise this

concern presupposes a level of knowledge and awareness of the health consequences of polluted water. This knowledge might have come about from education, observations or personal experiences.

The notions of threat or no threat, importance or no importance, high value or low value enable people to decide how to use the water. Current uses of water provide practical evidence to people on the potential uses to which the water can be put. Current uses cut across domestic and commercial uses as well as to fulfil specific ecological needs. It is based on the nature of current uses that future uses of a particular water resource may be recommended for specific purposes.

Findings for sub-research question 2(ii): What is the state of sanitation and solid waste disposal and management practices, and how do they influence people's perception, attitudes, and behaviour to water and environmental quality? are summarised as follows. If innovative approaches are employed to ensure that facilities which can contribute to reduction of water and environmental pollution are in place in communities, individual efforts are more likely to protect water and environment. In communities where some people are unable to afford toilets, where there are no environmentally friendly alternatives and the societal influence against environmentally degrading behaviour is low, a favourable attitude to the environment may not always correspond with behaviour which protects the environment [common in the peri-urban environment]. In communities where the people are able to afford toilets and there is influence from the society to engage in favourable behaviour, attitudes can predict behaviour [common in communities with high infrastructure provision].

There are situations where people cannot afford in-house sanitation facilities or toilets, but there are environmentally friendly alternatives at a cost and there is general influence from the society not to undermine the water and environmental quality [common in communities with medium and low infrastructure provision]. Under such circumstances, the restraining factor will be the cost of accessing the alternative. Lack of efficient systems to manage waste disposal, results in water and environmental pollution. A favourable attitude may not always correspond with favourable behaviour if other factors such as ease of accessibility and cost of services are not met.

The research question 2(iii): Does household assets' status, including income, influence attitudes to surface water and environmental quality? was responded to as follows. The qualitative analysis clearly indicated that people who can afford access to services are not likely to pollute the environment. However, when the attitude statements were correlated with selected socio-economic factors, no relationships could be established.

Finally, the findings for sub-research question 2(iv): In the light of 2(i, ii, and iii), how can perceptions, attitudes, and behaviour to surface water and environment be influenced by community and city initiatives? are presented as follows. To community members, responding to water, sanitation and environmental challenges requires attention and targeting of the root causes which relate to law enforcement. In the long term, law enforcement may have to deal with situations on a case by case basis. The use of water and environmental resources is not equitable. Occasionally, communities and individuals' surface water use patterns conflict, leading to consequences for the environment and surface water. City–community collaboration can help address these problems. Gender considerations are equally important in developing strategies for community capacity development. Since women in general are in charge of household water availability and solid waste disposal, their concerns as well as men's have to be addressed and integrated into community actions on water and environmental management.

The city authority, as a key stakeholder, is expected to stimulate and promote these processes in communities by empowering and strengthening these community initiatives. In general, related socio-economic issues can then be responded to. Issues making up the attitudes statements are relevant to both men and women respondents and therefore most of the differences in responses of men and women do not come out as significant, however, the differences between the communities are important considerations for interventions.

The next chapter considers the organisational and institutional context of water and environmental management in the city. Different organisations have various capacities and understanding of these capacities is important for recommendations that can support improvements in the sectors.

CHAPTER SIX : ORGANISATIONAL CAPACITY AND COMMUNITY PARTICIPATION IN INTEGRATED URBAN WATER AND ENVIRONMENTAL MANAGEMENT

This chapter responds to research question three on how **organizations can promote community participation in urban water and environmental management** with emphasis on the sub-questions: i) *what are the strengths, weaknesses, opportunities and threats of the selected key organisations in urban water and environmental management?* and iii) *in the light of the results from the study, what are the prospects for integrated urban water and environmental management?*

First, there is a presentation on some of the policies and programmes in the water and environment sector. This builds on the introduction to this topic presented in chapter two, section 2.1.4. An excerpt from the AMA bye-laws on the disposal of solid and liquid waste is presented. It is followed with an overview of some of the key organizations in Ghana and Accra in the water, environment and sanitation sectors, highlighting their mandates. This is followed by a discussion of the results of the interviews with key informants in the ten selected organizations, where strengths, weaknesses, opportunities and threats of the operations of these organizations as synthesized from the interviews are presented.

The analysis of strengths, weaknesses, opportunities, and threats (SWOT) was important in order to appreciate the strengths of the organizations in the roles they play in water and environmental management and to help in making recommendations on how to build on these strengths. Analysis of the strengths of the organizations was to help bring out and understand some of the organizational achievements. Analysis of the weaknesses was to help appreciate why things worked less optimally, or why they were working inefficiently in the water and environment sectors. Identifying the opportunities available to the organizations helped to understand some of the factors which are important for organizational strategic planning. If the threats of the organizations are well understood, this would support the development of mitigation measures.

Seven organizational capacity areas were included in the SWOT analysis: strategic programme planning which helped in understanding the mandate of the organizations; quality assurance which helped in appreciating the extent to which the products and services fulfilled standard requirements and practices; external relationships which

revealed the extent of collaboration with relevant organizations working on similar, or related issues in the water and the environment sector, which is important for optimizing resources and strengths; human resource management which helped in understanding whether the existing management structures and human capacity could allow the strategic plans to be implemented to achieve the intended results; financial management, to help understand the extent to which finance can constrain intended plans; communication and information management to shed light on how knowledge is being shared with relevant stakeholders; feedback and constraints were examined to show how the organizations were considering public concerns in their activities.

The above analyses were to help to understand the organizations in relation to how they could work with communities to respond to concerns on water and environmental pollution. The feedback obtained from the Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] on some of the issues which came up during the focus group discussions are integrated at this stage. The overall results of the study then help to respond to the sub-research question on the prospects of integrated urban water and environmental management where a reflection on the integrated approach that has been applied in the research will also be provided. This provides additional basis for recommendations that emerge from the research.

6.1 KEY LEGISLATION, POLICIES AND PROGRAMMES IN THE WATER AND ENVIRONMENT SECTORS

In section 2.1.4., an introduction to the policies, institutions, and processes was presented. The ten key organizations in the water sector were also mentioned in section 2.1.4. This section therefore builds on the policies, institutions and processes. The Ghana-Vision 2020, with its first medium term plan of 1997-2000 (Ghana Vision 2020, 1995) was followed by the Ghana Poverty Reduction Strategy (GPRS I, 2003 – 2005) and the Growth and Poverty Reduction Strategy (GPRS II, 2006-2009) (NDPC, 2005). In these documents, water and sanitation are presented as important development issues and thus a key focus for poverty reduction. In Ghana Vision 2020, Ghana's principal environmental problems are presented as pollution, deforestation, soil and coastal erosion and inefficient waste management; water is considered as essential to human life and the search for good quality water supplies have been fundamental. Policy programme objectives in water and sanitation include ensuring:

- *‘Access to reliable supplies of safe water for rural and high-density urban communities increased.*
- *Occurrence of water-borne diseases reduced.*
- *Facilities for the safe disposal of sanitary waste and sullage increased and improved.*
- *Systems for the safe disposal of solid waste strengthened.*
- *Facilitates for the safe disposal of industrial effluent strengthened.*
- *Solid waste and sewage treatment system increased and strengthened’*

(Ghana Vision 2020: 46)

6.1.1 Ghana Water Policy

The issues of water quality, sufficiency and continuity of supply are central to the provision of water. In the past, the government did not have a clearly articulated policy for the water sector as a whole. However, with the establishment of a Water Resources Commission in 1996 and ongoing donor support for the development of a water resources strategy, the wider water issues, including those relating to rivers, allocation of scarce supplies and pollution are receiving necessary attention. This is an essential step for management of water resources as an increased number of independent water supply systems become established (WaterAid, 2005).

The overall goal of the National Water Policy (NWP) (MWRWH, 2007) is *“to “achieve sustainable development, management and use of Ghana’s water resources to improve health and livelihoods, reduce vulnerability while assuring good governance for present and future generations”. This will be achieved by addressing relevant issues under water resources management, urban water supply and community water and sanitation. For each broad area, a number of focus areas for policy considerations have been identified”* – in line with the Ghana Poverty Reduction Strategy II broader objectives (NDPC, 2005). The NWP builds on earlier policies and programmes including the National Community Water and Sanitation Policy (see Appendix 6.1). The policy is a significant step forward towards, but does not yet constitute a national sector framework (NSF). In general, the NWP considers water as a right of all people; it recognizes water as a social good whilst acknowledging its economic value (MWRWH, 2007).

The objectives of the NWP are to:

- (i) adopt water resources planning as a cross-cutting basic component of national economic planning;*
- (ii) ensure preparation of IWRM strategies using the various river basins as the planning units;*
- (iii) establish appropriate institutional structures and enhance capacity building;*
- (iv) ensure water resources planning to be made with due recognition of “environmental flow” requirements;*
- (v) adopt sustainable practices that avoid damage to critical natural capital and irreversible ecological processes;*
- (vi) promote partnerships between the public and private sectors for the protection and conservation of water resources through the use of cleaner and efficient technologies, effective waste management and sound land management and agricultural practices; and*
- (vii) ensure cost recovery and sustainability of water projects, taking into account the specific needs and preferences of the poor.*

6.1.2 National Environmental Sanitation Policy (NESP Revised 2007)

The National Environmental Sanitation Policy (NESP)(Government of Ghana, 2010) was first promulgated in 1999 and revised in 2006/2007 to take into consideration the changing context of the national and international development priorities (Ghana Poverty Reduction Strategy, Millennium Development Goals, and New Partnership for Africa’s Development (NEPAD). The Ministry of Local Government and Rural Development (MLGRD) is responsible for implementing the Environmental Sanitation policy including management and regulation of solid and liquid waste by the local government bodies [The Accra Metropolitan Assembly and other districts are under the MLGRD]. The Environmental Health and Sanitation Directorate was transferred from the Ministry of Health to the Local Government Ministry in 1995 by a Presidential Directive to ensure compliance with the decentralization process which gave the environmental health and sanitation responsibilities to the local assemblies.

The Expanded Sanitary Inspection and compliance Enforcement (ESICOME)

This programme is an expanded and upgraded version of the existing Sanitary Inspection Programme. It is specifically targeted at the mobilisation of owners and occupants of premises, residential and others, to develop, provide for and maintain good sanitation on their properties and their environment. The ESICOME will be maintained as a core programme for sanitary inspection and enforcement (Agyare-Kwabi, 2009). Its impact is yet to be felt in many parts of the city.

Community Responsibility and Attitude and behavioural changes

Attitudinal and behavioural changes are central to achieving sustainable progress in environmental sanitation. Therefore, environmental sanitation education, effective communication and dissemination of information are considered in the National Environmental Sanitation Policy as integral elements of all environmental sanitation activities complementing the provision of sanitary infrastructure and services. Environmental sanitation is a public good. Ensuring good sanitation is therefore the responsibility of all citizens, communities, private sector enterprises, NGOs and institutions of Government (Revised NESP: 2007). Notwithstanding, there is the need for the key organizations [see section 6.2 below] to partner city authorities to guide communities and the public in their quest for decent sanitation and a clean environment.

Assessment of policy framework for pro-poor WASH service delivery

The National Water Policy, Ghana, is driven by the Ghana Poverty Reduction Strategy II, which is also in conformity with the Millennium Development Goal [MDG] targets, New Partnership for Africa's Development [NEPAD], and, above all, the Constitution of Ghana. The Appendix 6.1 presents a time line of the development of legislation in the water, sanitation and environment sectors (Fuest *et al.*, 2005).

Accra Metropolitan Assembly (Solid and Liquid Wastes Management) Bye-Laws

The decentralization policy of the government of Ghana allows the Metropolitan, Municipal and District Assemblies to promulgate bye-laws in response to needed regulatory frameworks. The section below presents some extracts from the 1995 AMA bye-laws which make it an offence for people to pollute the environment with both solid and human waste.

'In exercise of the powers conferred upon the Accra Metropolitan Assembly by section 79 of the Local Government Act, 1993 (Act 462) these bye-laws are hereby made:

- 1. The Accra Metropolitan Assembly or its registered agents or contractors shall be exclusively responsible for the management of both solid and liquid wastes within the entire area of the AMA administration.*
- 2. Every household, industry, offices and any other premises shall make its solid and liquid waste available to the AMA or its authorized agents or contractors.*
- 3. Solid and liquid waste made available by owners or occupiers of premises shall be collected, treated and disposed of at designated sites by the AMA or its agents or contractors.*

4. All occupiers or owners of premises with the exception of household premises shall designate a member of their staff to be directly responsible in all matters related to wastes management and liaise with the AMA or its contractors or agents.

5. Owners or occupiers of premises shall be responsible for the provision of containers that will be used in storing solid and liquid waste within the premises in consonance with specifications approved by the AMA.

6. Unless a pan latrine has been declared barred in any area of the Metropolis as enumerated in the schedule an owner or occupier of premises where pan latrine is used shall register such pan latrine with the AMA or its authorized agents or contractors for services. "

7. It shall be the responsibility of the AMA or its authorised agents. Or contractors to empty the contents of the pan latrine, treat and dispose of it at sites to be designated by the AMA.

8. A pan latrine shall be equipped with galvanised waste container in accordance with the standard prescribed by the AMA.

9. The AMA shall impose prescribed fees on an owner or occupier of premises where services are rendered for the disposal of liquid or solid wastes and such fees shall be reviewed from time to time.

10. A person who

(a) fails to provide a standard container as prescribed by the AMA; or

(b) receives services from unauthorised person or uses unauthorised containers; or (c) refuses to allow the AMA or its authorized agents or contractors to collect solid or liquid wastes from one's premises; or

(d) uses a pan latrine where it has been declared barred; or

(e) indiscriminately dumps solid or liquid wastes in open spaces, drains, gutters, behind walls or burns solid waste in one's compound commits an offence.

11. Where a person commits any of the offences specified in paragraph 10 of these Byelaws he shall be liable on summary conviction to a fine not exceeding ~200,000.00 or in default or payment to a term of imprisonment not exceeding six months or to both.

12. The Accra Metropolitan Authority (Solid Wastes Management) Bye-laws, 1991 are hereby revoked.

13. In these Bye-laws unless the context otherwise requires

"Person" mean both legal and natural persons;

"AMA" means Accra Metropolitan Assembly; "**Liquid Waste**" means night soil and effluent (from Septic tanks); "**Solid Waste**" means refuse and rubbish'. (Local Government Bulletin, 1995: 6-7)

Accra Metropolitan Assembly (Drainage of Wastewater) Bye-laws, 1995

The excerpt below presents the AMA bye-laws on drainage of wastewater.

'In Exercise of the powers conferred upon the Metropolitan Assembly by section 79 of the local Government Act, 1993 (Act 462) these Bye-laws are hereby made.

1. Every household, owner or occupier of premises shall connect a linkage of waste except sewerage, to the main drain or culvert wherever available.

2. These Bye-laws apply to premises such as dwelling houses, industrial or commercial houses, structures or sheds whether or not permanently occupied within the Metropolitan Assembly

3. The linkage drain shall be made of concrete and shall also be covered.

4. Any household, owner or occupier of premises shall build a soak-away to take care of waste water in places where a drain or culvert is not available.

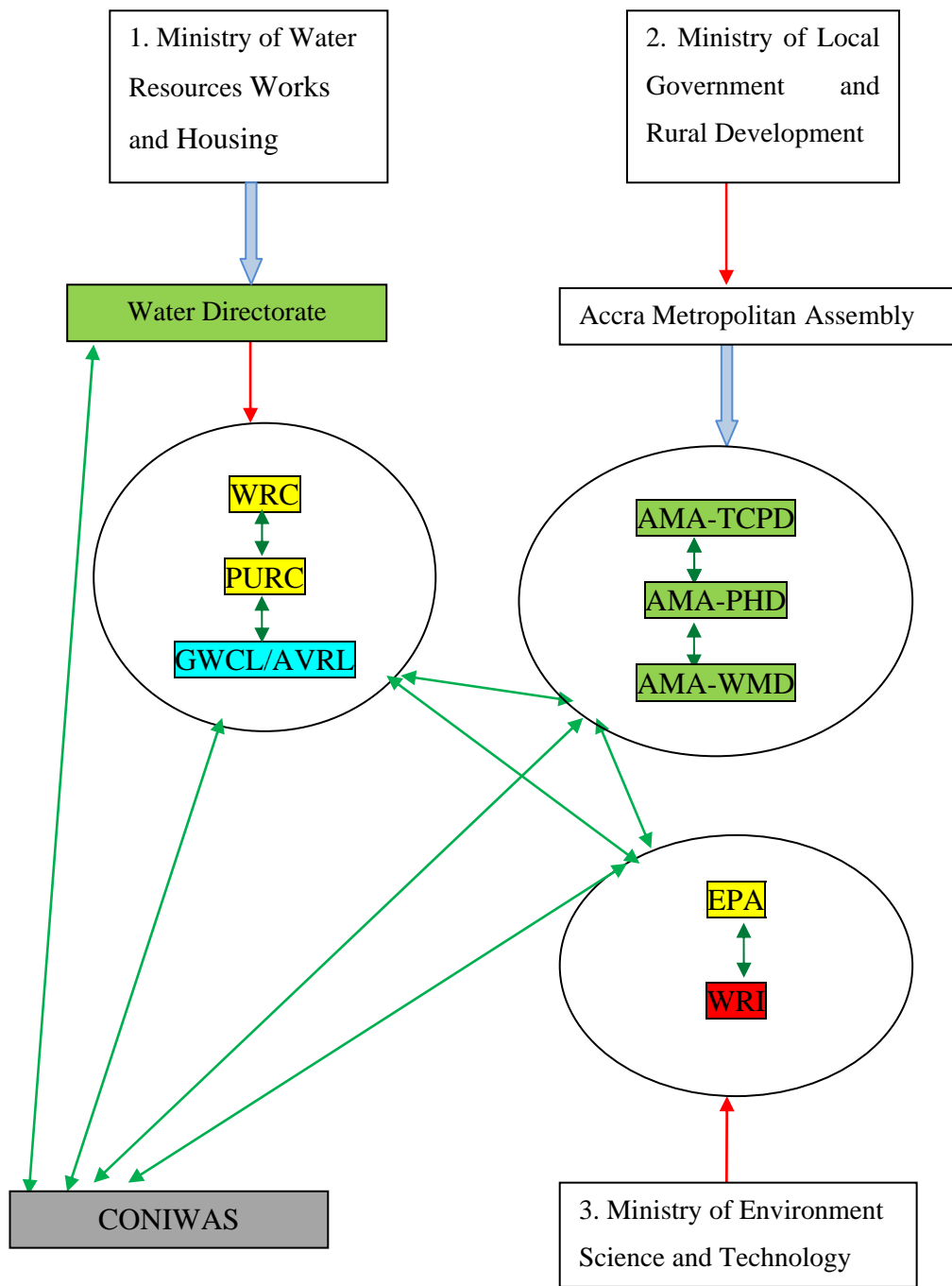
5. Any person who contravenes any of the provisions of these Bye-laws commits an offence and is liable on conviction to a maximum fine not exceeding 2300,000 or in default to a term of imprisonment not exceeding 6 months or to both' (Local Government Bulletin, 1995: 31-32)

6.2. SELECTED KEY ORGANISATIONS IN WATER, SANITATION AND ENVIRONMENT SECTORS.

This section presents a brief overview of the mandates of the selected organizations. In sections 3.1.3 and 3.2.1.3, the criteria for selecting the ten key organizations were presented and the approach to analysing the results of the organizational interviews was explained. The criteria used in the selection employed two key requirements – i) their importance in relation to organizational mandate and extent of involvement in water management issues; and ii) their influence in relation to the extent of power to affect people and events based on statutory, financial and human resources associated with water and environmental management.

Further information on the selected key organizations in the water and environment sectors are provided in the discussion of results of organizational interviews below. Figure 6.1 shows the ten selected organizations and the interrelationships in terms of structure and function. The structure of the organizations is in relation to the sector ministries where the governmental organizations sit. The organizations were selected to cover various functions in the water and environment sectors. Other organizations in the water and environment sectors which were not involved in the study are presented in Appendix 3.4.

Figure 6.1: Interrelationships of the ten selected organizations.



Legend:

WRC: Water Resources Commission; **PURC:** Public Utilities Regulatory Commission; **GWCL/AVRL:** Ghana Water Company Limited/Aqua Vitens Rand Limited; **AMA-TCPD:** Metropolitan Assembly-Town and Country Planning Department; **AMA-PHD:** Accra Metropolitan Assembly-Public Health Department; **AMA-WMD:** Accra Metropolitan Assembly-Waste Management Department; **EPA:** Environmental Protection Agency; **WRI:** Water Research Institute; **CONIWAS:** Coalition of Non-governmental organizations in the Water Sector. The **blue arrow** signifies direct line management; the **red arrow** signifies policy and supervisory linkages; the **green arrow** signifies operational networking. The circles show a group of organisations which are under the same umbrella organisation.

The ten selected key organizations are presented below according to their functions.

6.2.1 Regulatory Agencies [marked yellow on Figure 6.1]

*Environmental Protection Agency [EPA] [Environmental Quality Department]
[marked yellow on Figure 6.1] [Ministry of Environment, Science and technology]*

The Environmental Protection Agency [EPA] is a key organization in relation to pollution control and general environmental management. A summary of its mandate is presented below. The EPA is to:

- create awareness to mainstream environment into the development process at the national, regional, district and community levels;
- ensure that the implementation of environmental policy and planning are integrated and consistent with the country's desire for effective, long-term maintenance of environmental quality;
- ensure environmentally sound and efficient use of both renewable and non-renewable resources in the process of national development;
- The Environmental Protection Agency Act 490 defines the legal framework for the functions of the Environmental Protection Agency.

(source: www.epa.gh.gov)

Water Resources Commission [WRC] [marked yellow on Figure 6.1] [Ministry of Water Resources, Works and Housing]

The Water Resources Commission (WRC) was established by an Act of Parliament (Act 522 of 1996) with the mandate to regulate and manage Ghana's Water Resources and co-ordinate government policies in relation to them. The Act stipulates that ownership and control of all water resources are vested in the President on behalf of the people, and clearly defines the WRC as the overall body responsible for water resources management in Ghana.

The responsibilities of WRC, which are spelt out in Section 2 (2) of the Act, can be categorized as:

- Processing of water rights and permits;

- Planning for water resources development and management with river basins (catchments) as the natural units of planning
- Collating, storing and disseminating data and information on water resources in Ghana;
- Monitoring and assessing activities and programmes for the utilization and conservation of water resources.

(Source: www.wrc-gh.gov)

Public Utilities Regulatory Commission (PURC) [marked yellow on Figure 6.1]
[Ministry of Water Resources, Works and Housing]

The PURC is an independent body established under the Public Utilities Regulatory Commission Act (Act 538, of 1997), regulating and overseeing the provision of utility services (electricity & water) in the country with focus on water in 82 urban areas countrywide. The Commission is made up of nine members (appointed by the President), including chairman, executive secretary, representatives for labour (TUC), industry (AGI), and domestic consumers, plus four experts.

(Source: <http://www.purc.com.gh/>)

6.2.2 Other Government Bodies in Water and Environmental Management [marked green on Figure 6.1]

Water Directorate [WD] [marked green on Figure 6.1] [Ministry of Water Resources Works and Housing]

The Water Directorate of the Ministry of Water Resources, Works and Housing is responsible for water related programmes and policies. The Ministry of Water Resources, Works and Housing has as its main functions the formulation and co-ordination of policies and programmes for the systematic development of the country's infrastructure requirements in respect of Works [the rehabilitation, maintenance and reconstruction of public buildings and estates], Housing, Water Supply and Sanitation and Hydrology. The Ministry co-ordinates and supervises, by way of monitoring and evaluation of the performance of both public and private agencies responding to and participating in the realization of the policy objectives established for the sector.

(<http://www.water-mwrwh.com/aboutus.php>)

Accra Metropolitan Assembly-Town and Country Planning Department [AMA-TCPD] [marked green on Figure 6.1] [Ministry of Local Government and Rural Development]

The AMA-TCPD is one of the Departments under the Accra Metropolitan Assembly and is responsible for plans, layouts and permits for constructional works in the city. Its main functions are:

- Collection, collating and analysis of data on the natural and human resources of the Metropolis, and the production of reports thereon.
- Identification of resources and potentials for commercial, industrial, housing, transport and other development and designing appropriate programme of action to tap them.
- Coordination of diverse types of uses and developments of land promoted by various departments and agencies of Government and private developers to facilitate the achievement of the highest possible means of health efficiency and order in the physical environment.
- Preparation of detailed planning schemes in conformity with the Metropolitan Structure Plan; provision of detailed design of sub-urban centres in the metropolis; and other areas.
- The Department is also represented at all levels on many committees of the Metropolitan Assembly, such as Site and Service Committee, Works and Development Planning Sub-Committees of the Assembly amongst others as well as Departments at the National level.
- The Department is also the Secretariat of the Accra Metropolitan Planning Committee

(Source: www.ghanadistricts.com)

Accra Metropolitan Assembly Waste Management Department [AMA-WMD] [marked green on Figure 6.1] [Ministry of Local Government and Rural Development]

The Waste Management Department is responsible for keeping the Metropolis environmentally healthy and sound. It functions in:

- emptying of septic tanks
- management of treatment sites (1 out of 3 working)
- solid waste management (collection, transport, treatment, disposal of waste—*currently, all these are sub-contracted to private waste management companies, with the department assuming a monitoring role*, cleaning of drains; cleansing of streets and drains, public open places, and weeding of grass on roadsides and open public places
- sewage management

The Department supervises and monitors the activities of private contractors engaged by the Assembly in solid and liquid waste management. It also engages in the education of the public on waste management and the provision of sanitation facilities in homes.

(Source: www.ghanadistricts.com)

Accra Metropolitan Assembly Public Health Department [AMA-PHD] [marked green on Figure 6.1] [Ministry of Local Government and Rural Development]

The Department of Public Health of the AMA was set up to promote and safeguard public health. It is involved in assessing, correcting and preventing those factors in the environment that can potentially affect adversely the health of present and future generations. The Metropolitan Public Health Department is responsible for the dissemination of health information, advocacy, education, nuisance control and enforcement of regulations and bye-laws, and food and water safety.

(Source: www.ghanadistricts.com)

6.2.3 Research [marked red on Figure 6.1]

Water Research Institute [WRI] [Council for Scientific and Industrial Research reporting to the Ministry of Environment Science and Technology]

The WRI has a mandate to conduct research into water and related resources. In pursuance of this mandate, WRI generates and provides scientific information, strategies and services towards the rational development, utilization and management of the water resources of Ghana in support of the socio-economic advancement of the country, especially in the agriculture, health, industry, energy, transportation, education and tourism sectors. It is the national focal point for international water resources programmes of UNESCO, WMO, WHO, UNEP and IOC. It therefore hosts the Secretariat of the respective National Committees for International Hydrology and Water Resources Programmes and the International Oceanographic Commission.

(source: www.csir-water.com)

6.2.4 Service Provider [marked light blue on Figure 6.1]

Ghana Water Company Limited/ Aqua Vitens Rand Limited [GWCL/AVRL]

Established by Act 310, in 1960, Ghana Water Company Limited (GWCL) was mandated to provide, distribute and conserve water for domestic, public and industrial purposes in 84 urban systems throughout the country. It was also to establish, operate and control sewerage systems in Ghana. The Ghana Water Company Limited is no more in charge of the sewerage system except a limited role in parts of Accra. Today the Ministry of Local Government and Rural Development is responsible for urban sanitation and execute this through the metropolitan, municipal and district assemblies. The Ghana Water Company Limited has a formal agreement with tanker operators [private water suppliers] which enables recognized association members to access water from designated points at special rates. In 2005, the government of Ghana entered into a management contract with Aqua Vitens Rand Limited [AVRL] to lead in the management of water supply in the Country's urban areas.

(www.gwcl.com.gh)

6.2.5 Non-Governmental Organization [marked grey on Figure 6.1]

Coalition of Non-Governmental Organizations in the Water Sector [CONIWAS]

The CONIWAS seeks to mobilize the Non-governmental organizations in the water, environment and sanitation sectors into a formidable force that speaks with one coherent voice at different angles.

6.3 STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS OF THE SELECTED KEY ORGANISATIONS IN URBAN WATER, SANITATION AND ENVIRONMENTAL MANAGEMENT

6.3.1 Strategic programme planning and implementation

The relevance of strategic programme planning in the organizations is to set the overall goal and objectives which guide their operations, without which organizations lose focus of their mandates. This is usually done for a short term, medium term and long term. In line with this, the Environmental Protection Agency [EPA] operates by a set of objectives (Table 6.1; as synthesized from the notes of the organizational interviews). However, the objectives are not reviewed regularly. The Water Resources Commission [WRC] operates by a set of objectives, but when the need arises, other stakeholders are involved in the decision making process. Therefore it is expected that existing objectives can be amended as and when necessary. It is also anticipated that stakeholder concerns could be taken on board in the daily decision making processes [in the case of Water Resources Commission [WRC]].

Through the vigilance of the Public Utilities Regulatory Commission [PURC] and its engagements with the public, interventions have led to the closure of some water truck filling points in order to improve water supply to some affected communities in Accra. Interruptions or breaks in water supply could be related to similar incidents of low pressures reported at Abelemkpe and Dzorwulu. In Abelemkpe, the water truck filling point in the community may be a contributory factor; see chapter 4, section 4.1.1]. The Waste Management Department [WMD], the Water Research Institute [WRI], Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL], and the Coalition of Non-governmental organizations in the Water Sector [CONIWAS] equally operate by set objectives.

The WRI focuses on research; GWCL/AVRL on water supply and CONIWAS focuses on advocacy, education and contributions to policy formulation in the water sector. These are three equally important areas of the treated water supply and surface water sectors. Research is expected to feed the regulatory agencies and the government bodies in water and environmental management with the appropriate information for decision making. Research is anticipated to help the GWCL/AVRL to improve on services and equip the Non-Governmental Organizations (NGOs) with knowledge for effective

advocacy. Advocacy is also expected to put the Regulatory Agencies on their feet to fulfil their mandates and possibly influence policy formulation and implementation.

The strength of the organizations is that the objectives are supported by appropriate legislation except in the case of the Coalition of non-governmental organizations in the Water Sector [CONIWAS] (Table 6.1). Delays or lack of review of programmes is a major weakness of some of the organizations. This could lead to outdated activities that are unable to respond to the present water and environmental problems. There is also client driven research in the Water Research Institute (Table 6.1) but the extent of response is limited by the availability of funding. This can make it difficult to embark on relevant research. The weakness of the Departments of the Accra Metropolitan Assembly [AMA] is that major programmes would have to come from, or be approved by the umbrella organization; AMA and this can slow down innovations. Stakeholder involvement creates opportunity for most organizations to incorporate suggestions in formulating objectives. For governmental or semi-governmental organizations, political interference remains a major threat to continuity of programmes (Table 6.1).

Table 6.1: Strategic Programme Planning and Implementation [SPPI]

Organization	Type of plan	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [Environmental Quality Department] [R]	SPPI designed in relation to the mandate, objectives and the vision of the EPA.	Backed by appropriate legislation	Delays in amendment of programmes due to the long process they have to go through	Stakeholder involvement in programme planning	Political interference; legal challenge from companies, Reform can be delayed by outdated legislation
Water Resources Commission [WRC] [R]	5-year strategic plan.	Backed by appropriate legislation	Delays in review of strategy	Stakeholders can advocate for reform	Political interference
Public Utilities Regulatory Commission [PURC] [R]	Regulate water and energy sector	Liaises between service providers and consumers, mandate backed by legislation	Reform can be delayed by outdated legislation	Stakeholders can advocate for reform	Political interference; change in government can affect continuity
Water Directorate [Ministry of Water Resources Works and Housing [MWRWH] [OG]	Existing sector policies.	Formulate sector policies and promote appropriate sector legislation	-	Stakeholder involvement and consultation. Host several programmes and platforms	Political interference; change in government can affect continuity
Accra Metropolitan	Three lines of	Responsible	Not	A department of	Political

Assembly –Town and Country Planning Department [AMA-TCPD] [OG]	planning considered-National, Regional, district	for plan development	responsible for implementation of plans	the implementing body-AMA	interference
Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Policies from the city authority. Department considering 5-year plan	Regular review of policies	Key policies are dependent on mother organization -AMA	A department of policy formulating body-AMA	Political interference
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	A programme in place for its activities	-	Lack of review of programmes	Collaboration with communities and relevant organizations	Political interference
Water Research Institute [WRI] [RS]	Programmes run by Divisions	Broad internal consultation among divisions	Direction of research more of client driven	Knowledge generation for the sector	-
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] [S]	Established by legislation	Public Private Partnership to improve efficiency	-	-	Political interference
Coalition of Non-Governmental Organizations in the Water Sector [CONIWAS] [N]	Strategic document designed	Contributions from network of NGOs	-	Sector watchdog	Depends on existence of NGOs

R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-Governmental Organization

6.3.2 Quality Assurance

The second consideration in respect of organizational capacity is the quality assurance strategies employed. This is important because it allows progress and products to be assessed to ascertain to what extent effectiveness and efficiency have been ensured. The Environmental Protection Agency [EPA] has a comprehensive plan in place for quality assurance in a sector-wide approach, whereas the Water Resources Commission is applying a more programmatic approach focusing on implementation (Table 6.2; as synthesized from the notes of the organizational interviews). The Public Utilities Regulatory Commission [PURC] is also active in terms of procuring primary data that enables it to determine utility tariffs. This could be obscured by political influence and therefore restrain competitive decision making efforts by the Commission, consequently slowing down innovations in the water management sector (Table 6.2).

Responsibility for non compliance in the city planning process goes beyond the Accra Metropolitan Assembly Town and Country Planning Department [AMA-TCPD]. This is

because after the plans have been presented to the AMA, it is the leadership of Accra Metropolitan Assembly [AMA] [that is the office of the Chief Executive and the Metropolitan Planning and Coordinating Unit at the central administration of AMA] that is mandated to enforce the laws on permits to ensure that people seek approval before embarking on their projects. For example if Developer A fails to procure a permit for his/her development, it is the responsibility of AMA to ensure that the development is stopped after the Accra Metropolitan Assembly-Town and Country Planning Department [AMA-TCPD] has notified them of the breach. This implies that complaints on non compliance of plans should be directed to both the AMA central administration and its planning and coordinating unit.

At the Accra Metropolitan Assembly-Waste Management Department [AMA-WMD], whether results will be realised from these quality assurance procedures depends on the effectiveness of the process. In general the Accra Metropolitan Assembly-Public Health Department [AMA-PHD] acknowledges a lack of logistics to enforce the bye-laws of the Accra Metropolitan Assembly [AMA]. The Water Research Institute [WRI] and Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] organizations deal with water as a product and make recommendations for use or supply to customers and therefore any blunder could be disastrous for human health and environmental quality.

Table 6.2: Quality Assurance [M&E]

Organization	Type of quality assurance	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [R]	Various Departments are responsible for operational monitoring. Appropriate equipment for sampling and monitoring is available	Environmental management strategy helps to control pollution to the environment	Insufficient equipment	To aspire to meet international standards and also to ensure that monitored companies are operating by international standards	Persistence of non compliance with standards from companies that are monitored
Water Resources Commission [WRC] [R]	Defined indicators are detailed in reports	Activity /project specific indicators	Project driven	Involvement of external reviewers	Limited funds
Public Utilities Regulatory Commission [PURC][R]	Various departments responsible for monitoring, reporting, consumer service centre monitoring	Various aspects of service provision covered	-	Participatory monitoring with utility companies	Political interference
Water Directorate	Quarterly meeting, performance evaluation	Oversight of the water	Inadequate staff	Stakeholder involvement in	Limited funds

[Ministry of Water Resources Works and Housing [MWRWH] [OG]	of programme and staff; overseeing the water sector and monitoring agencies and their performance on programmes, policies, and project implementation	sector		sector monitoring	
Accra Metropolitan Assembly-Town and Country Planning Department [AMA-TCPD] [OG]	Physical development plans are renewable every five years. Planning process has an embedded control to ensure compliance. Every building or construction requires a building permit	Quality assurance is an on-going process without which the planning process will cease. Final decisions on permits are taken by the planning committee	logistics, financial, and capacity problems makes monitoring difficult	The multi-stakeholder nature of the planning process creates opportunity for various interests to be responded to	Limited by funds , political interference
AMA-Waste Management Department [AMA-WMD] [OG]	Daily inspections of solid waste collection bin sites or service areas, sanction non-performing contractors [imposition of a fine], inventories on sites, meetings with service providers	A monitoring programme in place	Not all sites are visited. In some sites solid waste remains for several days, Lack of logistics and appropriate capacity	Public feedback	Lack of funds
AMA- Public Health Department [AMA-PHD] [OG]	Field staff oversee activities, monitoring team to backstop field staff, regular reporting to the Director by District Officers, regular meetings	Qualified staff	-	Stakeholder involvement in monitoring	Limited funds and logistics
Water Research Institute [WRI] [RS]	Standard is based on WHO ISO 17025, GWCL/AVRL, international standards and that of the Ghana Standards Board	High standards of research, reliable research results	High cost of analysis	Client interest in specific standards, clients are both local and international and this could bring additional funds for research	Relies on government subvention which may limit research
Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] [S]	At GWCL/AVRL the river is tested before treatment. Every point of the production is tested till the final output. Regular reports on production activities	Quick identification of treatment problems at the head works	Lack of state of the art equipment	Consumer protection efforts by stakeholders	Leakages on pipelines negate these efforts
Coalition of Non-Governmental organizations in the Water	Ensures policies that members promote are pro-poor, code of ethics to guide members, copies of the annual	advocacy	low staff strength, funds, Logistics	Increase public education and awareness on relevant issues and thereby	Not backed by legislation

Sector [CONIWAS] [N]	reports of members			draw government's attention to concerns in water and the environment sector. Raise red flag for sector reviews	
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R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

If the Water Research Institute and GWCL/AVRL can ensure that reliable information on water quality and safe water is supplied to the public, then the requisite human resources, equipment and technology also have to be provided. This is a challenge and it is where the advocacy of the Coalition of Non-governmental organizations in the Water Sector [CONIWAS] can bring pressure to bear on government or other donor agencies to make more resources available. The CONIWAS also has the opportunity to explore other methodologies that will ensure that the outcomes of their programme implementation can feed into other development agenda of the nation and the city.

Among the strengths of most of the organizations are that there are monitoring programmes in place, or defined indicators are used (Table 6.2). The weaknesses of the organizations (Table 6.2) included obsolete equipment, poor logistics, and the fact that projects drive the direction of monitoring in some cases, rather than having a comprehensive monitoring programmes in place. This applies to situations where quality assessments have to be carried out for specific water and environment projects. Usually, these projects will specify the level of quality assessment needed. The involvement of external reviewers, the use of public views and participatory monitoring offer opportunities to the organizations. This would allow constructive feedback which can support innovations in the water and environmental management sectors. The lack of appropriate technology, logistics and political influence continue to threaten the monitoring process within the organizations (Table 6.2).

6.3.3 External relationships

The third consideration relating to organizational capacity is external relationships. This is important because it offers organizations the opportunity to cooperate and collaborate with relevant organizations in the sector so as not to duplicate efforts and waste resources. The regulatory organizations are networked with one another as well as other

organizations (Table 6.3). Table 6.3 compares some characteristics of the organizations in relation to networking as synthesized from the notes of the organizational interviews. The three regulatory agencies [EPA, WRC, and the Public Utilities Regulatory Commission [PURC] collaborate with one another.

The process of networking is expected to enable information and knowledge sharing to improve the water and environmental management. Engaging with the media is difficult for the Water Research Institute [WRI] due to cost and the challenge of the media understanding scientific issues. Through the Sustainable Water Management Improves Tomorrow Cities Health [SWITCH] project (a EU funded project), the Ghana Water Company Limited / Aqua Vitens Rand Limited [GWCL/AVRL] has been given a lot of visibility in terms of opening up to other stakeholders to share, learn and un-learn on the SWITCH Learning Alliance [LA] platform. The GWCL/AVRL has also been active on other platforms.

Table 6.3: External relationships

Organization	Type of external relationship	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [R]	With WRC and several stakeholders across various sectors;	A node for organizations in the water and environment sector	-	Stakeholder perspectives in programmes	The media [radio and television stations] portray it as inefficient
Water Resources Commission [WRC] [R]	Water Research Institute, Hydrological Services Department, Ghana Meteorological Services, EPA, Minerals Commission, International Water Management Inst., NGOs etc in effect all organizations in the sector and beyond including international agencies, stakeholder engagement;	A node for organizations in the water and environment sector	-	Concerns of the vulnerable taken on board	-
Public Utilities Regulatory Commission [PURC] [R]	WRC, EPA, Ghana Water Company Ltd./Aqua Vitens Rand Ltd, others;	Collaboration prevents duplication of efforts	Have been unable to reach the poor	Participatory water tariffication	-
Water Directorate [Ministry of Water Resources Works and Housing [MWRWH] [OG]	All key stakeholders; SWITCH, IRC, UN-habitat; CHF; donor agencies	Overall node for organizations in the water sector	Strength of linkages dissimilar	Several levels of collaboration allowing sector monitoring	

Accra Metropolitan Assembly –Town and Country Planning Department [AMA-TCPD] [OG]	The TCPD seeks to create and manage collaboration and partnerships with other organisations and stakeholders all the time	Controls permits for development within the catchment	-	Involve stakeholders as and when necessary	Lack of funds to hold electronic media education programmes
Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Sector ministries, contractors, Regional Coordinating Council, Assembly men and women, National Security, platforms	Engagements with contractors to oversee the sector	-	-	Lack of funding
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	Extensive stakeholder engagement and collaboration	Supports monitoring and programme implementation	-	-	-
Organization	Type of external relationship	Strengths	Weaknesses	Opportunities	Threats
Water Research Institute [WRI][RS]	Multi-stakeholder engagement in its services and participation on platforms	A key research organization	-	Reach out to new clients	Some relationships are project based
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] [S]	Multi-stakeholder engagement and on various platforms	A key water supply company	-	Stakeholder involvement helps to refine services	-
Coalition of Non-governmental organizations in the Water Sector [CONIWAS] [N]	Apart from being a platform of NGOs, the secretariat engages on other platforms and adopts multi-stakeholder approach	A key advocacy network	-	Categories of network members strengthens it	Depends on membership

R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

In the Water Directorate [of the Ministry of Water Resources Works and Housing [MWRWH], Accra Metropolitan Assembly-Waste Management Department [AMA-WMD], AMA-Public Health Department, and AMA-Town and Country Planning Department, the process of networking and partnership formation is very important for managing the city's water and environmental resources and avoiding duplication of programmes and efforts. The afore mentioned organizations show stakeholder interaction and consultation in the water and environment sectors and that should allow for knowledge generation, sharing and dissemination in a form that can encourage a paradigm shift in the water and environmental management sectors.

The AMA and its departments, as indicated above, are under the Ministry of Local Government and Rural Development. Prior to the SWITCH project, the AMA had its own arrangements [which are still practiced] where the heads of the Departments meet

for reporting purposes. However, following the intervention of SWITCH Learning Alliance [LA], the relevant departments [AMA-Town and Country Planning, AMA-Waste Management Department, AMA-Public Health Department and AMA-Planning and Coordinating Unit of the central administration [which is not discussed in this chapter], have been given the opportunity to interact more on the activities of the SWITCH-LA platform.

It is possible to say that SWITCH Learning Alliance has stimulated further interaction and engagement. There is more the departments can do beyond the traditional meetings of the heads of the departments. The same Sustainable Water Management Improves Tomorrow's Cities Health Learning Alliance [SWITCH LA] platform has allowed the departments of the Accra Metropolitan Assembly [AMA] to engage and perhaps understand better the operations of the Water Directorate of the Ministry of Water Resources Works and Housing, for example.

The Water Directorate [of the Ministry of Water Resources Works and Housing] is directly involved in managing the Odaw-Korle River system through the Korle Lagoon Ecological Restoration Project [in which large areas of the channel for the river in the city have been rehabilitated and the lagoon areas dredged and also engineered to divert the polluted upstream waters directly into the sea].

The Accra Metropolitan Assembly-Town and Country Planning Department [AMA-TCPD] contributes indirectly to ensure that development within sections of the catchment is permitted. The Accra Metropolitan Assembly [AMA]-Waste Management Department contributes indirectly in the management of the catchment by ensuring that contractors provide bins for solid waste disposal in the communities and manage waste in Accra in general, such that the pollution in the river is reduced. The AMA-Public Health Department augments the efforts of the AMA-Waste Management Department by educating the populace to ensure good sanitation and environmental cleanliness and good hygiene. This interaction is important for improving the environmental conditions and possibly the water quality of the river.

The Coalition of Non-governmental organizations in the Water Sector [CONIWAS] draws attention to the social issues which have to be considered in addressing the water challenges which the city and the country face. CONIWAS, as a platform, also ensures

representation on other platforms to drive forward the agenda of improving access to water and promoting effective and efficient management of water resources. Since water management issues are multi-sectoral, it is usually expected that various organizations may be involved in different aspects. The challenge comes when roles are not clearly defined in water and environmental management because the issues are multi-sectoral and therefore require an interdisciplinary approach to respond to them. Therefore these aspects of external relationships show what stakeholder integration of efforts can help achieve for the water and environment sectors.

In terms of strengths, the regulatory organizations serve as nodes for organizations as well as the Coalition of Non-governmental organizations in the Water Sector [CONIWAS] and that ensures interaction among stakeholders in the water and environment sectors. The richness of the networking comes from the diverse mandates of the organizations such as water research, water supply, water and environment monitoring, water and environment services provision and advocacy among others [including several others that are not discussed here, including donors, media, etc]. Adopting multi-stakeholder perspectives and taking on board the concerns of the vulnerable in programmes offer opportunities to organizations. Threats to organizations are in the form of misunderstanding in the media, insecure or lack of funding, and project based [or short term] relationships in some cases.

6.3.4 Human Resources

The fourth consideration of organizational capacity is human resources. This is important because it is the people with the appropriate or relevant knowledge, skills and expertise who can effectively and efficiently implement the details of the strategic plans of the organization. Hence, it is expected that organizational performance will be significantly influenced by the strength of its human resources. The synthesis from the organizational interviews is presented in Table 6.4 below.

Staff of the Environmental Protection Agency [EPA] has high self motivation and the promotion path is also clearly defined. Nonetheless, staff turnover at EPA is said to be high. Mentoring or professional development is absent except some *ad hoc* arrangements. Though performance appraisal is carried out regularly, there is the perception that human resource issues could be improved. In relation to the Water

Resources Commission [WRC], there is a transparent staff recruitment process. Staff motivation at the WRC stems from job satisfaction as in the case of the EPA.

Unlike EPA, the promotion path is not clearly defined at the WRC; it is more of an informal arrangement based on the role, seniority, in terms of experience and years in the organization. Unlike EPA, there is a mentoring system in place to train the young staff of the WRC. Performance appraisal is relaxed for senior staff at the WRC but enforced for junior staff. There is a kind of a plan in place for professional progression with regular annual training in the WRC. Similar to the EPA and the WRC, the Public Utilities Regulatory Commission [PURC] has a transparent recruitment policy but could also regularize qualified interns to become staff.

The Public Utilities Regulatory Commission [PURC] needs clearance from government before it can recruit, without which staff requirements cannot be realized. Similar to the Environmental Protection Agency [EPA], there is a high staff turnover at the PURC.

Table 6.4: Human Resource [HR]

Organization	Practice	Strengths	Weakness	Oppor-tunities	Threats
Environmental Protection Agency [EPA] [R]	Qualified staff employed, promotion path obvious; staff development needs improvement	Equal opportunity by gender	Lack of adequate staff motivation, weak reward system	Attract qualified staff	Funds, high staff turn over
Water Resources Commission [WRC] [R]	Remuneration in line with public sector policy	Staff motivated by job satisfaction, gender representation, mentoring system in place, annual training, study leave on scholarship after three years of employment	Promotion path not clearly defined, performance appraisal restricted to junior staff	Attract qualified staff	Funding
Public Utilities Regulatory Commission [PURC] [R]	Staff have adequate skill and experience, performance appraisal, no formal mentoring, open recruitment	Competitive and equal opportunity in recruitment , regular training	Promotion path depends on the line manager	-	High staff turnover due to lack of job satisfaction from lack of opportunity to use expertise, clearance

	system				needed before recruitment
Water Directorate[Ministry of Water Resources Works and Housing [MWRWH] [OG]	Process of building staff strength	Oversee the water sector	Low staff strength	Some staff are on secondment from sector agencies	Limited funds, unable to attract requisite staff
Accra Metropolitan Assembly – Town and Country Planning Department [AMA-TCPD] [OG]	Recruitment and remuneration in line with civil service policy	Promotion path in line with civil service rules, equal opportunity for staff	Staff appraisal not observed, no mentoring or professional development for staff	-	Limited funds
Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Annual staff recruitment	Attract qualified staff, regular staff trainings	Staff lack adequate skills since they are now involved in monitoring instead of actual waste management	Participation in conferences	Lack of logistics for monitoring
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	Recruited by Ministry of Local Government and Rural Development	Promotion path is clearly defined, performance appraisal done and tied to promotion, equal opportunity for staff,	Lack of staff motivation, lack of staff development	-	Limited funding
Water Research Institute [WRI] [RS]	Staff recruited through laid down procedure, qualified staff	Recruitment competitive, plan in place for staff development, promotion path clearly defined, training through sponsored programmes, performance appraisal is key for staff promotions	-	-	Limited funding
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] [S]	HR Department handles all staff issues,	Promotion path clearly defined, appraisal system efficient and transparent, mentoring and coaching, equal opportunities for staff	-	-	-
Coalition of Non-governmental organizations in	Very limited staff	-	-	-	-

the Water Sector [CONIWAS] [N]					
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R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

Though the PURC is a public organization, conditions of service are perceived to be better than many other public organizations. Thus the high turnover is attributed to a lack of a job satisfaction resulting from a lack of opportunity to apply acquired knowledge and expertise to address problems. Mentoring at PURC is informal. At the PURC, though performance appraisal is carried out regularly, the promotion path is not clearly defined since it depends on one's line manager who has to recommend the staff member for promotion.

The four government bodies in water, sanitation and environment sectors: Water Directorate, Accra Metropolitan Assembly-Town and Country Planning Department [AMA-TCPD], AMA-Waste Management Department, AMA-Public Health Department, have a system in place for recruiting qualified staff. Staff of the above four organisations have low motivation. The four organisations have systems for performance appraisal except the AMA-TCPD. The performance appraisal is important for promotion. The Water Directorate [MWRWH] has employed some staff through its agencies which have a better reward system than it has.

At the Water Research Institute [WRI], performance appraisal is also important in promotion and assessments, unlike some other government organizations [such as the Accra Metropolitan Assembly-Town and Country Planning]. It is expected that high staff motivation will allow organizations to attract and keep qualified staff to do research. The mentoring system, coaching system, and the succession plan at Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] are aimed at ensuring a fair system and equal opportunity for all [since this is not common in wholly government run organizations, it may be that the partnership with AVRL to operate Ghana Water on behalf of GWCL could have played a part). The Aqua Vitens Rand Limited may have brought some of their expertise to bear on the GWCL/AVRL partnership].

The Coalition of Non-governmental organizations in the Water Sector [CONIWAS], in spite of their contributions to the water and environment sectors, have an undeveloped

human resource capacity attributed to the fact that members all belong to organizations with their own operating structures. Some of the strengths in the organizations described in Table 6.4 are equal opportunities for staff, training programmes and the fact that the promotion path is clearly defined. Threats to human resources in the organizations remain as lack of funding and high staff turnover.

6.3.5 Financial management

The fifth organizational capacity consideration is financial management. Sound understanding of how funding for the organization is procured is important. This also encompasses the internal and external controls in place for financial management. It is anticipated that sound financial management will enable organizations to channel their resources into the appropriate tasks aimed at achieving the organizational goals. The synthesis of the organizational interview in respect of financial management is presented in Table 6.5 below

Table 6.5: Financial Management

Organization	Sources of funds	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [Environmental Quality Department] [R]	Government subvention, fees from permits, projects, consultancies	Laid down financial procedures, internal auditors	-	External sources of funding	Low number of projects affect funding availabilities
Water Resources Commission [WRC] [R]	Government subvention, projects, internally generated funds	Internal and external auditing	The Commission cannot negotiate for increment in subvention	External sources of funding	Low projects affect funding availability
Public Utilities Regulatory Commission [PURC] [R]	Government subvention, DFID, World Bank, other donor agencies	Internal and external auditing	-	External sources of funding	-
Water Directorate [Ministry of Water Resources Works and Housing] [MWRWH] [OG]	Government of Ghana, Donor agencies	Internal controls follow Gov. of Ghana structure on internal and external auditing	-	External sources of funding	Limited funding
Accra Metropolitan Assembly –Town and Country Planning Department [AMA-TCPD] [OG]	Government of Ghana, Bilateral donor	Internal and external auditing	-	-	Difficult to seek funding from donors

Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Government subvention to AMA, internally generated funds to AMA	Internal and external auditing	-	-	No external sources of funding
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	Government of Ghana, donor agencies	Internal and external auditing	-	-	No external sources of funding
Water Research Institute [WRI] [RS]	Government of Ghana, donor agencies	Internal and external auditing	-	External sources of funding	-
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL][S]	Government and donor agencies	Internal and external auditing	-	-	Limited funding
Coalition of Non-governmental organizations in the Water Sector [CONIWAS] [N]	Membership contributions, donor agencies	Annual auditing of accounts	-	-	Limited funds for its activities

R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

All three regulatory agencies; Environmental Protection Agency [EPA], Water Resources Commission [WRC], and Public Utilities Regulatory Commission [PURC] depend on government of Ghana subvention and it is important for running the organizations (Table 6.5). The EPA and the WRC in addition, have access to some internally generated funds through issuing permits. This implies that in the case of EPA and WRC, if some innovations were made in the financial processes involved in internally generating funds, it is possible that increased inflow of funds could support further activities to improve water and environmental management in the city. Although the PURC is expected to wean itself off government subvention, that is yet to happen. It will require innovative approaches to put in place a system that will generate enough for the Commission's activities since it does not issue any permits.

In general, it is expected that in any organization if the internal and external auditing systems are effectively applied it should lead to appropriate use of funds. Sound financial management is also more attractive to donors. The other level of this discussion will be the quality component of these auditing systems in the organizations. These systems are based on government of Ghana standards which are expected to be high and rigorous.

In the case of the Water Directorate [Ministry of Water Resources , Works and Housing], Accra Metropolitan Assembly-Waste Management Department [AMA-WMD], AMA-Public Health Department, AMA-Town and Country Planning Department, all receive government subvention for their activities with the Water Directorate benefiting from additional donor support. Currently, it is observed that the Water Directorate appears to receive much donor funds for its activities, which constitute its core funding. In all government sectors, it is mandatory for an internal auditor to be employed.

Similarly, the strict financial management at the WRI ensures that funds received are utilized for the intended purpose and thus making available relevant information for effective decision making in water and environmental management. The WRI has been given some autonomy to generate some of its running cost internally, injecting responsibility financially and so it has to position itself to attract the best of clients with whom to do business. Most of the organisations have laid down financial regulations with the involvement of both internal and external auditors in financial management (Table 6.5). There are also opportunities to seek non-government sources of funding though. Since government organisations are allocated specific amount of money, research into the sector could be limited without additional non-governmental funding.

6.3.6 Communication and information management

The sixth organisational capacity consideration was communication and information management. First, this is important for internal exchanges and delivery of instructions. Information produced by organisations has to be packaged in a form that is relevant for decision making and for sharing with other stakeholders in the sector. One area that is expected to strengthen external relationships of organisations is their ability to communicate effectively and package information in forms that their partners can use without difficulty. In this light, Table 6.6 below presents a synthesis of the organisational interviews.

At the Environmental Protection Agency [EPA], internal communication is carried out through telephone and internet, memos, reports, among others (Table 6.6). External communication employs both print and the electronic media. The EPA has a library that is accessible to the general public. Information at the EPA is stored in both print and electronic formats. Similarly, clear lines of communication exist at the Water Resources

Commission [WRC] and Public Utilities Regulatory Commission [PURC] where information is stored in both print and electronic formats. Internal communication is enhanced through telephone and memos. Regular physical meetings also help in communication.

At the WRC, a special strategy on external communication targets specific organizations. All three regulatory bodies have websites for disseminating information. The Public Relations Directorate of the Public Utilities Regulatory Commission [PURC] is responsible for external communication. This role is played by the education division at the WRC and the EPA. External communication at the PURC is carried out by the Executive Secretary or the relevant Department whereas the consumer Directorate focuses on Public education. This is to help streamline what goes into the public domain.

Table 6.6: Communication and information management

Organization	Type of communication and information management	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [Environmental Quality Department][R]	Information Communication Technology [ICT] and print media, Internal data archives, public library available, clear lines of communication, websites	Sensitive to gender and diversity,	-	Education, Knowledge sharing, influence public behaviour change, library open to the public	Unreliable internet services, high cost of radio and television education Programmes
Water Resources Commission [WRC] [R]	Clear lines of communication, ICT, print media, websites, quarterly meetings, electronic materials available to the public for download	Communication strategy targets specific organizations, information available for both internal and external usage.	-	Education and knowledge sharing	-
Public Utilities Regulatory Commission [PURC] [R]	Public Relations Officer in charge of external affairs, a unit in charge of education, websites, print media	Open to the public, sensitive to gender issues, production of education materials		Education and knowledge sharing	No library to disseminate information to the public
Water Directorate [Ministry of Water Resources Works and	ICT, website, print materials, shared at seminars and conferences, hold several	Host annual water forum	No library	-	-

Housing [MWRWH][OG]	platform meetings				
Accra Metropolitan Assembly –Town and Country Planning Department [AMA-TCPD] [OG]	Insufficient computers, Project based PR unit	-	No library, Information kept mostly in print format, making it difficult to disseminate, Limited internet connectivity	-	Civil service rules may restrict access to own information, lack of funds to document at the national archives, radio programmes expensive
Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Communicate through meetings, reports, seminars, conference, personal consultations, print media	Hold public fora, organizational change is amply communicated	No library to disseminate information to the public	-	
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	Internal and external communication through print media or phone, e-mails, external information sharing requires clearance from the management	Sound data management	No library to disseminate information to the public	-	
Water Research Institute [WRI] [RS]	ICT and print media well developed for both internal and external communication, regular seminars, website, functional public library, data storage by each division	Stakeholder meetings and public/media interaction, staff durbar held twice a year, library	-	Dissemination of research findings through stakeholder engagements	-
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] [S]	ICT and print media for internal and external communication, website	Interacts with and host researchers and students, operates call centres	-	-	-
Coalition of Non-governmental organizations in the Water Sector [CONIWAS] [N]	ICT use for internal and external information exchange	-	Outdated information on website	-	-

R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

The Accra Metropolitan Assembly-Town and Country Planning [AMA-TCPD] is challenged with information sharing and dissemination. It also has some challenges with ICT and management of internal data. Innovative approaches will be needed to manage information and data in forms that can be accessible easily for decision making and for knowledge transfer in the water and environment sectors. The AMA-Waste Management Department and AMA-Public Health Department both use ICT and standard procedures for communication and information sharing and dissemination, although these come with their challenges.

Communication is very important as it tells different stakeholders about what has been done in the form of data, information and results and it drives what is to be done. A clear line of communication exists in the Water Research Institute [WRI]. The Ghana Water Company/Aqua Vitens Rand Limited [GWCL/AVRL] has restructured its communication lines since the GWCL/AVRL partnership was established. This includes both the print and the electronic media [radio, television, telephone systems, internet etc]. Standard Information Communication Technology [ICT] is employed for internal and external communication.

The Coalition of Non-governmental organizations in the Water Sector [CONIWAS], despite its contribution in the sector, runs an outdated website thus making it difficult for it to disseminate relevant information through this medium. The strengths in the ten key organizations discussed above are the fact that ICT is employed in communication with both print [letter, memos, newspapers etc] and electronic media [telephone systems radio, television, internet etc] employed in information management. A key weakness in some of the organizations is the absence of public libraries to make information accessible to the general public and unreliable internet services.

6.3.7 Feedback and complaints

Feedback can help reshape major government policies and interventions and therefore impact on the environment and the lives of the inhabitants. All the three regulatory organizations have laid down procedures for receiving feedback or complaints from the public (Table 6.7). In the case of the Water Directorate [Ministry of Water Resources Works and Housing [MWRWH], Accra Metropolitan Assembly-Waste Management

Department [AMA-WMD], AMA-Town and Country Planning Department, AMA-Public Health Department, all four organizations have some form of system for receiving feedback from stakeholders. The role of feedback in the way things are done in the organizations is sometimes threatened by political influence.

Table 6.7: Feedback and complaints

Organization	Description	Strengths	Weakness	Opportunities	Threats
Environmental Protection Agency [EPA] [Environmental Quality Department] [R]	Open to feedback and complaints from the public	The public make use of this facility	Its effectiveness uncertain	-	Political interference
Water Resources Commission [WRC] [R]	Code of conduct and mechanism to receive feedback from the public	Code of conduct support engagement with stakeholders	-Its effectiveness uncertain	-	Political interference
Public Utilities Regulatory Commission [PURC] [R]	Receives complaints from the public	Helps Commission to respond to public concerns	-Its effectiveness uncertain	-	Political interference
Water Directorate [Ministry of Water Resources Works and Housing] [MWRWH] [OG]	Feedback received on policies at workshops	Shapes government policies	Its effectiveness uncertain		Political interference
Accra Metropolitan Assembly –Town and Country Planning Department [AMA-TCPD] [OG]	Client service unit receives complaints and feedback from the public	-	-Its effectiveness uncertain	-	Political interference
Accra Metropolitan Assembly-Waste Management Department [AMA-WMD] [OG]	Feedback received through seminars and fora, letters, complaints register, code of conduct and engagement	-	-Its effectiveness uncertain	-	Political interference
Accra Metropolitan Assembly-Public Health Department [AMA-PHD] [OG]	Complaints registry, civil service code of conduct	-	Its effectiveness uncertain	-	Political interference
Water Research Institute [WRI] [RS]	Client service unit receives feedback	-	Its effectiveness uncertain	-	
Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] [S]	Toll free call centre; number for receiving text messages available	-	Its effectiveness uncertain	-	-
Coalition of Non-governmental organizations in the Water Sector	Feedback received at Annual general meetings, conferences and	-	Its effectiveness uncertain	-	

[CONIWAS] [N]	workshops, social tools used to receive feedback from communities on the level of service provision				
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R=Regulatory; **OG**=other government bodies in water and environment; **RS**=Research; **S**=Service provider; **N**=Non-governmental organization

6.3.8 Brief reflection on legislation, policies, programmes

The previous sections show Ghana as having an appreciably sound organizational and institutional setting in place for managing water, sanitation and the environment. The expectation therefore would be that the challenges facing the water and environment sectors would be within manageable limits. It is also worthy of notice that the system in place has made some efforts and attained some achievements in this. Yet in chapters four and five, the continued problems which the water and environment sectors face were presented. The next section considers organizations and community participation in water and environmental management.

6.4. ORGANISATIONS AND COMMUNITY PARTICIPATION IN WATER AND ENVIRONMENTAL MANAGEMENT

This section presents a synthesis of the field research in order to help identify some of the relevant issues which the key organizations in the water sector could address in collaboration with the communities.

In an attempt to understand how the communities and Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] could collaborate in order to respond to some of the current water supply and access challenges, the following issues discussed in the focus groups in communities were raised with the GWCL/AVRL and received the respective responses quoted below:

1. Billing system, discrepancy between water used and the bill, non engagement of GWCL/AVRL with consumers on water billing; and training for meter reading attendants

“Water meters are read in a particular period in the month. The information is processed by the MIS [Managements Information Systems] department to generate the respective bills. After 2006, the billing process was decentralized and is now done in almost every district. Bills are distributed timely these days and if there is any challenge it is included in the next month’s bill. Sometimes customers overlook faulty taps and this

contributes to unexpected high bills. There are some customers that are not metered and therefore an estimate based on certain factors in the home is paid -whether water flows or not. Customers who are not satisfied with their bills can request for a meter. For customers who had a meter previously, the history of the meter can be used to calculate an average. Customers with estimated rates will therefore continue to be charged that rate until they lodge a formal complaint. There is regular training for meter reading personnel. Occasionally, community durbars² are organized by some communities to engage with the company. Individuals are also encouraged to contact the 'Call centre' which is toll free. There are text numbers for customers to send text messages to the Company. These have been publicized”.

Therefore, the Ghana Water Company Limited /Aqua Vitens Rand Limited [GWCL/AVRL] encourages community members to approach the company to discuss any issues which lack clarity. This is because, in the view of the company, everything possible is being done to ensure that customers are not overcharged on water use. This response does not however, deny the fact that communities have issues with the cost of water which were presented in chapter four, sections 4.2.1 to 4.2.2. The Public Utilities Regulatory Commission [PURC] also has an important role to play in this, because it is the organization that determines water tariffs in the country. The PURC could equally team up with the GWCL/AVRL to reach out to the communities and explain the factors considered to determine water tariffs.

2. *Plans to deal with water access problems*

“A list of projects has been executed in the past and many are coming up to deal with the situation. Investors are welcome. The essence of the partnership between GWCL and AVRL is to make urban water viable. As part of that management contract, support came from the World Bank”.

The GWCL/AVRL admits that although something has been done to address the water supply and access challenges, a lot still remains to be done. As part of organising community participation, pressure could be brought to bear on the government to invest further into the water sector so as to make water available for all in the right quantity and quality and at the right time in communities. Organizations such as Coalition of Non-governmental organizations in the Water Sector [CONIWAS] are well placed to support communities to embark on campaigns to demand for improved services in the water supply sector.

² Informal gathering of community members usually initiated by community leadership where every member of the community is welcome to participate. During this gathering relevant issues relating to access to water or the community are discussed.

3. *Non-response to complaints of pipeline breaks; how broken pipes are tracked.*

“Response time is less than 48 hours. The challenge is that instead of calling the company, customers rather call radio broadcasting stations to lodge their complaint and these stations may not get back to the company for action to be taken. Secondly people are not able to provide a good description of the location of the fault. A GIS technology would have been able to identify the location of the faults without difficulty”.

This calls for increased engagement and collaboration between the utility company and the community to encourage community members to report cases of pipe breakages and for the company to also enhance its technology and efforts at identifying faults on pipelines.

4. *Hours of opening taps/ water rationing*

“There is a daily deficit of about 50 million gallons of water in Accra. Other factors such as in-line pumps [illegal pumps on pipelines], in-line reservoirs [illegal reservoirs on pipelines] make it difficult for pressures to build up for people to receive water, so pressures build up in the night for people and water is also rationed”.

The Ghana Water Company Limited/Aqua Vitens Rand Limited acknowledges community concerns on the irregularities in water supply in the city and communities. Indeed, the process of rationing is worsened by other factors indicated above and explained in 5 below.

5. *Closing tap water without prior information*

“Cost of informing people through all radio stations will be huge so what is done is to make use of four key ways to announce [Television, newspaper, radio, and public address systems]. Announcements are always put up into the public domain unless the situation is unscheduled, due to power outage or pumps tripping off. In such situations due apologies are rendered to the customers”.

Improvements are needed in this area as communities often do not get any information or explanation from the company on the irregular flow of water. In order to build trust on various levels to encourage the communities to collaborate with the company, it [GWCL/AVRL] has projected itself as one that is willing and working to respond to community concerns in order to improve water supply services in the communities and the city in general.

6. *Illegal connections and illegal pumps on water pipelines*

“Unaccounted for water is between 40-45 % for both physical and commercial losses. Currently there is a loss control team working together with the police. There is also a Geographic Information Systems [GIS] department that is mapping our entire jurisdiction where all houses will be located on a GIS map. There is also a compensation package for informants on illegal connections. There is an arrangement to regularize illegal customers who own up and report. Illegal pumps are rampant in Nima where people mount pumps and sell the water to others. Regular operations are carried out to arrest illegal water users”.

This is also a case of admission of community concerns and the efforts being put in place to address the challenges. If the Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] wants to enhance community awareness of their response, then they need to engage more to assure them of acknowledgements of the concerns of people and encourage communities to demonstrate patriotism by ensuring that illegal connections are reported. In order for community members to risks passing on such information, there would be the need for a system that will ensure strict confidentiality and protection of the identity of informants.

7. *Treatment and removal of all types of contaminants, worms in water and particles in water, poor pipe layouts and waste water contamination*

“The WHO standards and Ghana Standards Board specifications are applied in quality assurance of treated water. Water produced at the head works satisfies all the standards. There is also post production chlorination at certain points to prevent water contamination. The quality assurance unit samples water from the communities and tests it. The raw water is first tested before treatment and every point of production is also tested hourly. In case disparities are observed between the quality in the community and the head works, investigations are conducted and faults rectified. Human factors could also be the cause of the contamination and here it is expected that customers will demonstrate responsibility and report cases. The GWCL/AVRL has standards for laying pipelines, in respect of the depth pipelines should be buried. Up to 90% of exposed lines, usually known as ‘spaghetti’ lines are illegal connections. If the main line is far off, another line is laid in such places to allow prospective customers to be connected. It takes 14 days to get connected from start to finish but varies depending on the number of applicants in the queue. Unavailability of materials could also delay such a process; customers may also delay in paying since payment needs to be done before a prospective customer is connected”.

The GWCL/AVRL does not dispute the fact that communities have challenges with their water quality, but projects the company as having acted in good faith to ensure that the right standards of treatment are applied to the water before it is supplied to the city. So it is important that the nature of these human factors which the company admits

could also be responsible for any contamination are considered and appropriate solutions found to them.

Secondly if the company admits that over 90% of exposed lines are illegal connections, then efforts must be taken as a matter of urgency to address this challenge to increase water availability for customers in various communities and most importantly, prevent possible water contamination. The response from the company did not suggest that they have received complaints on water contamination resulting from the layout of pipelines leading to people's houses. It could be difficult for one to be certain of contamination when no test have been carried out. Contamination could results from wastewater intruding into pipelines through cracks on the lines.

Further suggestions on how the organizations in the water and the environment sectors can work with communities have been presented as part of the recommendations in chapter seven, section 7.2. The next section looks at the prospects of integrated water resources management [IWRM] in relation to the approach adopted in the study.

6.5. PROSPECTS FOR INTEGRATED URBAN WATER AND ENVIRONMENTAL MANAGEMENT

Integrated water resources management[IWRM] is a systematic process for the sustainable development; allocation and monitoring of water resource use in the context of social, economic and environmental objectives [see Chapter 2, section 2.6]. The process of IWRM was inspired and is guided by the four Dublin principles on water and sustainable development. In the light of the findings presented in this thesis, a brief reflection on the integrated approach employed in the investigation is provided using the four Dublin principles as a guide.

The four Dublin principles are:

- i. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment*
- ii. Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels*
- iii. Women play a central part in the provision, management and safeguarding of water*

- iv. Water has an economic value in all its competing uses and should be recognized as an economic good*

Principle I: Water as a finite and vulnerable resource

The research has set out how development in the catchment has had an impact on the environment and how the environment will continue to bear the consequences of actions of people [Chapters 2 and 5]. The surface water resources of the city continue to dwindle and if efforts are not sustained, such resources will be lost in quantity and quality in the near future. As demonstrated in chapter five, the upstream-downstream user relations come up strongly, whereby the water loses its quantity, quality and value as it flows downstream. In some cases, the water is of no value downstream due to absolute pollution of the resource.

This research has demonstrated that indeed the water resources of Accra [also supported in chapter 2 by reference to surface water resources of other cities that have deteriorated in quality] can potentially be lost because of their finite nature. It has shown how human activities are responsible for such pollution and degradation of water resources in the catchment [chapters 2 and 5]. Therefore in line with the findings of the study [presented in chapters 4 and 5], water resources management should continue to be promoted in a holistic manner taking cognizance of the key themes raised in the definition of the Integrated Water Resources Management [IWRM] above. This is because the various relationships of water resources with other factors are more appropriately considered if the issues are viewed in a wider ecological, spatial, economic, social, political and institutional perspective with a focus on equity and sustainability.

Nations have developed their own versions of this principle and have made strides in their implementation. Ghana has done same as indicated above [see section 6.3]. Following interaction with stakeholders and reflection on the findings presented in this thesis and the insight that the concept and notion of vulnerability of water resources are perceived differently in various catchments, water managers should implement it in the context of their specific situation while acting in line with the principle. Therefore this principle has been shown to be relevant by the evidence from this study and the continuous development of its application should support integrated water resources management in the coming years as new themes emerge in water and environmental management.

Principle II: Participatory approach

- i. Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels*

From the beginning of the thesis it was argued that there is a need for a people-centered approach to responding to water resources management. The application of the livelihoods approach [Chapter 2] is one of the ways of doing that, by putting people, organizations, and institutions at the centre of research and development interventions.

An approach of wide consultation with relevant stakeholders [communities, organizations, city authorities, and local authorities, among others [Chapter 3] was employed in the investigation. Participatory approaches go beyond just informing or consulting people, but require a systematic approach to get people doing things for themselves which will lead to the protection of their water and environmental resources. It has also been argued that there is a need for consensus building in communities, organizations, between organizations, and even synchronization of policies and programmes in the effort of managing water and the environment [Chapters 5 and 6].

The research has indicated the need to develop capacities at various levels to ensure that there is indeed real participation of all stakeholders. As was demonstrated in chapter three, the extent of consultations and engagements [focus group discussions, household interviews, other interactions in the community and key informants interviews in organizations] embarked upon in this research has resulted in a rich diversity of ideas that emerged from the investigation and has led to a better understanding of the different perspectives on the issues at stake. This demonstrates the relevance of eliciting different shades of opinion in the process of water and environmental management. Therefore the process of Integrated Water Resources Management [IWRM] holds the prospect of limiting possible conflicts that might arise from specific interventions in the water and the environmental management process, because it attempts to bring stakeholders to a shared understanding and acceptance of the realities on the ground. It helps stakeholders to accept targeted interventions within the same environment. It offers the opportunity to manage expectations of stakeholders from the individual to the national level in the process of IWRM.

However, although all relevant stakeholders should be involved, the process of IWRM cannot wait for everybody to get on board before it starts rolling. This investigation

provides an example (also indicated in section 6.2). In the research, key organizations were prioritized and involved. Some organizations that were contacted on several occasions and yet were not ready for any engagement were not allowed to delay the process indefinitely. Thus, the important thing is to identify the key actors and start with them. The process can proceed as others are introduced onto it along the line. It cannot wait indefinitely for any particular stakeholders to get on board. The key challenge of this principle is that it is a time consuming process. Though there are prospects for engaging with all relevant stakeholders, *in future, further effort will be needed to reduce the amount of time it takes to get stakeholders who have little interest on board as discussed above*. The time demanding nature of the approach also increases running costs of engaging stakeholders, such as arranging meetings, providing refreshments, communication costs etc. In the study, many calls and physical contacts had to be undertaken with communities and organizations. However, one could also argue that, if the benefits of reduced conflicts are counted; they may outweigh the negative effect due to time and running cost.

Principle III: The important role of women

- i. Women play a central part in the provision, management and safeguarding of water*
The role of men and women has been presented in both chapters four and five, which describe how men and women play diversified roles. Section 4.2.2 and chapter five bring out gender differences in the analysis where these exist. Integrated Water Resources Management [IWRM] seeks to promote the principle of women's participation and it requires gender awareness.

Women are the group that usually performs the role of ensuring that there is water in the house; they lead in many of the water dependent occupations; they go to draw water from the rivers and the streams and also direct the children where to dispose of solid and other waste. Men often create and lead most of the community associations which supervise people in water and environmental management activities in the form of clean-up exercises and general pollution prevention [for example in Abelemkpe, Dzorwulu, Nima etc. - Chapter five]. Both men and women operate informal solid waste collection that can sometimes lead to environmental pollution. It is important for the future that as water issues become more and more topical, the decision making process adequately involves women as domestic water 'managers'. *Since many cultures, traditions and religious practices continue to sideline women in decision making*

processes, there are prospects for change in the sense that as water becomes more and more scarce, these barriers would have to give way to accommodate the opinions and role of women in water and environmental management.

Principle IV: Water as an economic good

- i. Water has an economic value in all its competing uses and should be recognized as an economic good*

Chapter 4 set out the issues relating to the cost elements of accessing and using potable water. It indicated that the Ghana Water Company Limited/ Aqua Vitens Rand Limited [GWCL/AVRL] need capital injection to be able to offer treated water to the public. It was outlined how the PURC determines the cost of water in consultation with the utility company and other stakeholders, subject to government's approval.

There are other private but secondary water suppliers who trade the water produced by the GWCL/AVRL [such as water truck/tanker operators]. Households have to invest some money to access the GWCL/AVRL water. Those without taps in their houses have to purchase water from the private vendors. For both treated and raw water, the goal of cost recovery is to manage demand through economic instruments. Clearly water has a value as an economic good. However, surface water also has historical, spiritual, and social value. Water is thus also a social good.

This principle has remained largely relevant. However, as water scarcity increases and the water purchasing power of the vulnerable drops, the future will demand a sound balancing of the economic with the social value of water. This will ensure that in our quest to ensure economic efficiency in water use, equity, environmental and ecological sustainability are adhered to. In the end, the prospects for Integrated Water Resources Management [IWRM] depend on the extent to which it creates enabling environment for institutional roles and use of management instruments for managing the water and environment sectors.

6.6 SUMMARY

The main research question 3: How can organizations promote community participation in urban water and environmental management?, was answered through the sub research questions below. The findings relating to the sub-research question 3(i): what are the

strengths, weaknesses, opportunities and threats of the selected key organisations in urban water and environmental management? are as follows. Ghana appears to have made progress in creating an organizational and institutional setting for managing the water and the environment sectors. The water and environment sectors have evolved in response to specific needs. This is because of the different organizational-governmental, non-governmental, private, and civil society and the institutional, policy, and the legislative framework. The diversity of the organizations is important to create synergies in the sectors to respond to problems.

The organizational structures operate within a certain policy and legislative framework. Ghana's policy on water, environment and sanitation considers debates and relevant research in both the global and national context as well as the principles of sustainable development. It has attempted to respond to the MDGs and various declarations by the UN on water, sanitation, and the environment, thus, policy and legislative framework has been appreciably sensitive to international opinions in the sector. Therefore the policies and the legislative framework are formulated in good faith, to protect the environment and safe guard human life and livelihoods through access to clean water, decent sanitation and environment.

Organizations involved with regulation, policy formulation or implementation as in government bodies in water and environmental management, agencies, research, service provision and advocacy have different strategic plans in place to guide the way things are done in the water, sanitation and the environment sectors. These strategies range from cases where there is regular review and modification to ones that may be out of touch with current realities on the ground.

The strategic plans could also be programmatic or sector wide. Organizations with flexible strategic plans create opportunities for inclusion of current but relevant concerns and issues in their activities. At a more advanced stage, organizations may consider specific issues of relevant stakeholders in developing their strategic plans. Conversely, innovations in the sectors could be slowed down by outdated organizational strategic plans [For example the Environmental Protection Agency, Table 6.1].

The strategic framework is supported by appropriate legislation to provide the contextual and legal framework for the water, sanitation and the environment sectors.

The organizations in the sectors continue to evolve after many years of establishment since some are influenced by political decisions. Therefore whether organizations will realize their mandates or not depends to some extent on the freedom to operate within the organizational strategic planning framework. There have been instances where the Public Utilities Regulatory Commission proposal to allow the Ghana Water Company Limited /Aqua Vitens Rand Limited to charge a certain rate for water was disallowed by the government. There have also been instances where the AMA-Town and Country Planning proposals to the central administration of the city authority were not adhered to.

The different organizations in the water, sanitation and the environment sectors have adopted specific tools to ensure quality. This is to indicate that they are concerned with standard procedures. Organizations responsible for policy and legislative aspects of land and water have tools tailored to respond to the quality of the expected outcomes and services.

Aside from the specific organizational quality assurance needs, a synergy of the strengths of these organizations can allow them to draw one another's attention to areas requiring consideration in their endeavours. It is expected that organizations with functional quality systems will be able to introduce amendments that can lead to improvements in their operations. This will make them relevant to current integrated approaches in water and environmental management. Lack of adequate budgetary support, human resources, and logistics are problem areas for the organizations.

The regulatory organizations [Environmental Protection Agencies, Public Utilities Regulatory Commission, and Water Resources Commission] serve as a node for networking with other organizations. Each organization has its own network of organizations in water and environment sectors. These networks have evolved over the years in response to the call for integrated approach to water and environmental management.

Human resource practices are adapted to respond to the unique situation within organizations in the water and the environment sectors. However, what are important are systems that ensure transparency in the recruitment, reward systems, career development paths, promotion paths, recognition of expertise and contributions to the

organization, among others. Human resource practices in the water and environment sectors vary by type of organization. Organizations operating under civil service policies appear to require a review of current practices in order to retain staff and ensure that there is organizational memory.

Sentiments of job satisfaction are more likely to be expressed in quasi-government or semi-autonomous organizations than in wholly governmental organizations. Whereas some organizations show evidence of progressive evolution, others may stifle the desire of staff to remain in the organizations, resulting in high turnover. Therefore organizations have a lot to learn from one another in respect of human resource practices. Organizations with the most appealing Human Resource systems are more likely to attract and retain staff.

Governmental and semi-governmental organizations depend on government subvention, which perhaps indicates the strength or the limitation that these organizations are exposed to. The regulatory organizations as well as the organizations dealing with water as a direct product or raw resource [Ghana Water Company Limited / Aqua Vitens Rand Limited; Water Research Institute], have the opportunity to support their budgets with internally generated funds from their respective activities. This has proven to be useful.

The regulatory agencies, government bodies in charge of water and environmental management, and organizations offering services or providing water supply all have had the opportunity to receive donor support. Donor support is given more favourably to some organizations than others, possibly because of the relative functions of such organizations.

It appears that current financial management procedures in place are able to control the incidence of corruption. Although the general perception in the city is that government organizations tend to be corrupt, it did not emerge in my interaction with organizations that corruption or misappropriation of funds has been a bane of any of the organizations in the water and the environmental management sectors. Some of the current problems in the water and the environment sectors were thought to have been as a result of lack of sufficient budget allocation. Organizations apply different aspects of Information Communication Technology (ICT) for both internal and external communication, though this has problems. The regulatory organizations, the government bodies in water

and environmental management, the water supply and research organizations appear to have a better ICT system than the departments in the AMA. Problems related to reliability of connectivity and outdated websites remain.

In relation to sub-research question 3(ii): ‘In the light of the results from the study (as presented in chapters four, five, and six, what are the prospects for integrated urban water and environmental management?’, the study has shown that an opportunity exists for more active participation of communities and community-led associations and groups in water and environmental management. Furthermore, communities have their local knowledge and perceptions. Thus, the prospects for successful water and environmental interventions can be improved through an understanding of this local knowledge and perceptions as well as community collective action. Women and children play major roles in water use and other environmental services demand (see chapter four) and therefore their involvement in interventions is important. The investigation has shown that different groups of stakeholders introduce diverse knowledge in water and environment issues and therefore there is the need for more effective development of relationships. This is important in strategic planning in the sectors (see chapter five and six). Improved stakeholder relationships will promote co-development of issues related to water and environmental management. This can be realised by building organisational and institutional capacity (see chapter 6).

CHAPTER SEVEN : GENERAL DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

In chapter one, the study was introduced, defining the goal, the objectives and the questions which were to guide the investigation. The goal of the study was to understand the contribution water makes to livelihoods of urban and peri-urban households; the factors influencing perceptions, attitudes and behaviour in relation to surface water and the environment, and measures for promoting community participation in water and environmental management. Three key research questions were formulated from the objectives of the study (see section 1.2):

1. How does access to water for domestic and productive uses affect households and their well-being?;
2. Do perceptions, attitudes and behaviour have an effect on the quality of surface water and the environment and can this be influenced?;
3. How can organizations promote community participation in urban water and environmental management?

In chapter two, the basis for the objectives and related research questions were clarified by examining gaps in the existing body of knowledge, the relevant theoretical underpinnings, and how the investigation was going to contribute to address identified gaps in knowledge. This was followed with the approach to the investigation and the rationale for the approach used. The results from the investigation were presented in chapters four, five, and six.

This chapter therefore discusses the main findings of the investigations and their implications for urban water and environmental management. The conclusions are integrated with the main findings. Relevant recommendations to respond to the problems which have been identified in the investigation are also presented. The limitations of the research are discussed and this is followed with suggestions for future work which could help responds to some of the pertinent questions that emerged from the study and if answered, might improve understanding in the area of the research.

7.1 GENERAL DISCUSSION AND CONCLUSIONS

The section outlines the details of the main findings and their implications, leading to various recommendations.

7.1.1 Water and livelihoods

This section presents the main findings relating to research objective one: **to investigate access to and uses of water and their effects on households including income and well-being.**

7.1.1.1 Access to water

The study found that access to water varied across different levels of infrastructure provision because the GWCL/AVRL supply networks are either insufficient or absent from some communities. Consequently, households without an in-house tap water connection have to depend either on their neighbours and therefore rely on positive social relations within communities, or on other water suppliers such as water tanker trucks.

Since households without a tap water connection or opportunity to fetch water at the PURC rate have to pay for water at the private charge rate, they end up paying more for less water as compared to those paying at the PURC rate. This means that government interventions on subsidies relating to the cost of water may not be able to achieve their intended purpose since the majority of the poor do not own tap water connections. Thus, a different approach has to be used to reach the poor.

In some instances, female headed households who are provided accommodation by family relations benefit from their water cost being absorbed by their host. This is a type of social support and therefore the savings can be spent on other household needs. The study found that women in their role as ‘managers’ of household water, were supported by their children. In some male headed households, women are also responsible for paying for the cost of water. This means that the concerns of both men and women will be important in measures aimed at improving access to water.

7.1.1.2 Decisions and choices about water dependent occupations and their role in livelihoods

The research found a wide range of occupations depending on water, with some more associated with the low and medium infrastructure (and also lower income) communities. An example was food preparation and sale, since many households depend on street foods in these low income areas. The market demand implies that practitioners that have recorded satisfactory sales will be encouraged to continue with

their business. Others with basic understanding of the needs of the people in the communities will also stand to benefit by providing what the population needs. A reliable market implies that people can recoup their investments over time.

The study found that profits from water dependent occupations are not necessarily proportional to the size of the investments. This is because many of the products of water dependent occupations do not have standard prices across the city. Therefore, how the business will fare will depend largely on the skills of the sales person, the local socio-economic situation and the willingness of the people in communities to patronize the products and the services of the businesses, and the quality of the products being sold. However, if the product has standard price such as sachet water or bottled water, then investments can be proportional to the profits. Since profits are not determined necessarily by how much is invested in water dependent occupations, it implies that low income households can equally benefit. Such occupations can therefore make an important income contribution to different households.

In terms of income contribution to households, male headed households were not necessarily better off than female headed households. The research also found that though water dependent occupations are profitable across communities with different levels of infrastructure provision, in terms of the proportion of profits to households, they tend to be higher in low and medium infrastructure communities (also low income). This is made possible by the existing high demand for the products and services of water dependent occupations. Furthermore, small quantities of water are usually used for water dependent occupations because they are conducted on a small scale. Therefore if there is an efficient water supply system, it can support low income households to improve their income status. The livelihood strategies of households include identification of and investment in occupations that can help them improve their income status.

The research did not find many functional occupational associations within communities which sought to promote membership activities in the city. In Dzorwulu, though farmers live outside the community, they do have a functional association which has helped promote their collaboration with development oriented non governmental organisations, as a result of which there have been some policy changes in support of urban and peri-urban agriculture in the city. There were also a few in the peri-urban

communities. In Accra, although there were associations for hair dressers and traditional caterers, the majority of practitioners belonged to no occupational association. Thus, practitioners cannot all speak with one voice about their common concerns.

The study found that households recognized the role of both internal factors (household circumstances-such as ability to afford their needs; the number working; capacity and skills of members etc.) and external factors (access to jobs, market, support etc.) which influence what people do or can do. Most importantly, the influence of parental interests were emphasized by household informants where in some cases parents encouraged their children to train for similar occupations, or sometimes the parents train their older children to take over from them in their occupation. Thus, local and external circumstances and opportunities are more likely to lead households into their livelihoods rather than an active attempt by households to sit together and assign particular occupations to its members as its strategy.

The study of different urban and peri-urban livelihoods has shown that water dependent occupations not only contribute income, but constitute a major occupational choice by households. The conditions required for households to engage in water dependent occupations are very flexible and opportunities can actually be created and used by households. It is the combination of household circumstances, social processes and the economic setting which determines the occupational choices of households.

7.1.1.3 Wealth status of households (computed from assets ownership) and the construct of poverty

The study found that two different forms of wealth clustering, computed from assets ownership (physical, social, human, and natural assets) were associated with households. The first wealth clustering relates to socio-economic status of households as measured by more formal employment and high ownership of physical, financial and human assets, whereas the second wealth clustering relates to the socio-economic status of households to the extent that they benefit from more fluid and flexible access to informal income generating activities with little ownership of particular physical assets. In general, the two forms of wealth clustering are to some extent mutually exclusive, such that households doing well on the more formal opportunities normally will not do well on the informal opportunities and vice versa. This means that every household benefits from these two forms of wealth clustering (every household has some amount

of physical and human assets, and some form of income generation). The research found that high household income is normally associated with high wealth status (more formal opportunities and ownership of physical and human assets), though there can be some exceptions. Thus, assets status can be used as a proxy to understand people's wealth status and possibly predict their financial position. The differences between male and female headed household's wealth status varied across communities with different infrastructure provision.

In reference to the more formal opportunities of wealth clustering, male headed households at the peri-urban and medium infrastructure provision communities were higher than the female headed households. Male headed households in peri-urban and medium infrastructure communities had a higher mean number in formal occupation. The formal wealth cluster of female headed households was higher than the male headed households in the high infrastructure provision communities whereas that of the low infrastructure provision communities were similar. In the case of the high infrastructure communities, the male headed households still had a higher mean number in formal occupation and therefore suggest that females were higher in terms of ownership of physical assets.

In the case of the more informal cluster of wealth, female headed households recorded a higher value than the male headed households in the peri-urban communities. This is in line with the fact that male headed households were ahead in the more formal type of wealth cluster. Whereas that of the male and female headed households in the high and medium infrastructure provision communities were similar. Female headed households of the high infrastructure communities were not expected to be higher because they were ahead in the more formal cluster of wealth. In the case of the medium infrastructure communities, male headed households were also not expected to be higher because they were ahead in the more formal cluster of wealth. In the low infrastructure communities, male headed households were higher than the female headed households. This is because the more formal wealth cluster was almost similar and therefore any of the sexes could be expected to be higher.

The communities recognized different facets of poverty. Poverty is not only associated with lack of financial resources, physical assets, or natural assets, but with poor development of social and human assets resulting in a low quality of life in households.

Poverty is manifested in forms of behaviour that lead to water and environmental pollution, because the poor are perceived as not likely able to afford the cost of accessing facilities and services. It was also perceived that decisions and livelihood choices are, most of the time, not able to take them out of poverty. Both households' characteristics and external circumstances are recognized as influencing household poverty. This reinforces the fact that communities' construct of poverty must be explored and understood to ensure successful interventions in poverty reduction.

An important finding is that the reported mental state of the poor is such that they are frequently locked up in anxiety, fears, and uncertainties about providing for their households (see section 4.4.2 and the theme called anti-social and unproductive attitudes and behaviour). This is a drain on the health of the poor and therefore can render some unable to achieve their potential. A stable mind can allow household members to engage in more reflective decision making.

People's constructs of wealth and poverty present their general desired livelihood outcomes. In doing this, people draw on local knowledge, perceptions, experiences, and circumstances. People's constructs of poverty are related to local factors and perceptions of well-being. The research also found that there are differences in terms of the cycle and type of poverty. In terms of the cycle, some households have to engage in begging occasionally or are taken care of by friends and family relations; some struggle to provide for the household. In terms of the type of poverty: there is low household capacity and financial resources; low access to opportunities presented by the market and other external factors; low ownership of certain physical assets at the community level such as social amenities (water and sanitation provision); and the type which has to do with mental state and attitudes and behaviour to water and environmental pollution. These differences determine whether people will be trapped in poverty or not. Those who are trapped in poverty have a series of options. They may improve their effort, rely on important others, society or prevailing opportunities in the market to break out of poverty. Poverty is indeed multi-dimensional and it is important that efforts to investigate them look at them in a holistic manner. A good understanding of the multi-dimensional nature of poverty can improve the success rate of poverty reduction interventions.

7.1.2 Perception, attitudes, behaviour

Livelihood opportunities arising from surface water use are constrained by water and environmental pollution which affects its quality. The study found that people's observations, experiences, information, knowledge, and skills, shape their perceptions which in turn enables people to decide how suitable the water and the environment are, and therefore what possible uses could be considered. The investigation found that current use of surface water determines the future uses which people might be willing to consider. In instances where people are aware of the health implications of using a polluted water source, the economic benefits may not deter them from its use (such as urban farmers in Dzorwulu). The sections below present how the research objective 2: 'to investigate perceptions, attitudes, and behaviour which affect the quality of surface water and the environment', was addressed.

7.1.2.1 Explanations for people's perceptions

Perceptions are also determined by the existing social and cultural setting where knowledge about water and environment are commonly shared in the community. In line with perspectives on social representations (shared concepts and themes through which groups organize and understand their environment) (see section 2.6.2), the research found that there were common concepts (solid waste, industrial waste, human waste, particular human behaviour etc) employed by people to explain their perceptions. These concepts had their locally assigned meaning and therefore their presence in the environment was likely to promote similar perceptions and explanations by people. Through interactions and engagements, local knowledge and its interpretations are shared among community members. Sub-groups (communities in this case) will rely on local definitions relevant to their explanations in any particular situation.

Furthermore, the research found that there could be a classification of a particular social construct and variants of it employed to explain a phenomenon (for example, different modes of contamination from water and the environment to humans and livestock). Some of the explanations are centred on how human behaviour affects people and their environment. As long as the knowledge about water and the environment are common to the communities, it is drawn on when necessary to explain individual or group behaviour. Knowledge of the past circumstances and specific uses of water and environmental resources are shared with the new generation of community members and through this perceptions are formed [this also means that it is possible for

misconceptions in explanations to be passed on to the succeeding generation of residents].

Local knowledge about changes in resources form part of people's perceptions on water and environment. In some instances, explanations for a local phenomenon are presented with definitions and meanings which are relevant in other communities (in terms of water use) to help draw comparisons. In explaining people's perceptions, a particular section of the sub-group may tend to draw on some specific themes more than others (e.g: women and health issues; men and wastewater or storm water channels or community collective action).

Therefore interventions in water and environmental management should explore and understand the perceptions and the factors shaping them. The findings can then be included in interventions to respond to identified problems.

7.1.2.2 Perception, attitudes and behaviour based on inefficiencies in systems

The research also found that perception of water and environmental quality are also based on the consequences of failures in the enforcement of laws on both sanitation and solid waste management by the city authority which has resulted in lack of decent sanitation and solid waste collection services.

In the light of lack of decent sanitation and waste collection services, three different relationships between attitudes and reported behaviour were identified in the study. In the first case, which was common in the peri-urban areas, a favourable attitude to the environment by community members may not result in favourable behaviour (as reported by informants) in relation to sanitation if there are insufficient toilets, inadequate alternatives with no influence from the society or community to protect water and the environment.

Secondly, in the high infrastructure communities, favourable attitudes to the environment by community members are more likely to correspond with favourable behaviour, because there are adequate sanitation and solid waste collection facilities and services. This is in addition to the perceived influence from the community members to protect water and environment.

Thirdly, in the medium and low infrastructure provision communities, favourable attitudes may not lead to positive behaviour if people have insufficient toilets, there are no public toilets, and people cannot pay to access public toilets, even though there is some influence by community members to protect water and environment. Additionally, if people cannot pay to access solid waste disposal services, or if the collection bin is perceived to be too far away, even if no fees are required, these factors may determine whether some households will pollute or not.

The above observations indicate that explaining attitude and behaviour relationships is complex and therefore if different aspects of water and environmental problems are explored they will deepen understanding to enhance the prospects of interventions.

In instances where the reported behaviour of some people is not in line with the generally desired behaviour, as it occurred in Kokomlemle, Sabon Zongo, and Nima, conflicts are likely to occur between community members. This indicates that there are many people who wish for behaviour that will not pollute water and the environment. Therefore holistic measures are required to respond to water and environmental pollution.

Perception and attitudes are also based on what the city authority is doing in terms of urban management to control pollution, especially the management of water channel infrastructure. The study found that poor monitoring and supervision of the construction of state sponsored wastewater channels has resulted in systems in the city that are unable to perform their intended functions because of engineering design defects (see section 5.2.5-environmental quality change and community governance and section 5.3.2-urbanisation and planning). It is important for the city authority to ensure high quality standards in the delivery of products and services by its staff and consultants. Without this, the quest for improvement in water and environment will remain illusory.

7.1.2.3 Explaining attitudes and behaviour in relation to water and environmental management

All the three predictors of behaviour (that is attitude, subjective norm, and perceived behavioural control of the Theory of Planned Behaviour - TPB) were relevant in observations at community level (as reported by informants). Attitude, subjective norm,

and perceived behavioural control, consistent with the TPB, combined in relation to local social and economic circumstances to influence actual behavioural control.

One of the attributes of social representation is for groups to attribute evidence of negative behaviour and attitude to the influence of external people. This was particularly observed in the high infrastructure provision communities. Local perceptions and definitions leads to one group considering itself superior in terms of behaviour, to other groups. This attitude may lead to the restriction of the provision of pollution control facilities if they are associated with communities perceived as inferior in behaviour regarding water and the environment, although there may be a real need for the facility (such as the Dzorwulu community indicating that they will not allow construction of public toilet, because public toilets are usually found in poor areas of the city).

The convergence of social representation and the TPB is at the subjective norm where the influence of society is expected to either promote or undermine behaviour which protects water and environment. Society may also adopt a passive attitude to a particular behaviour. Since social representation is the way in which society makes meaning of their environment, depending on the subjective norms, the community will prevent or promote behaviour that pollutes the environment. A breakdown of community collective action, which will usually operationalise the social representations, seems to be the case when local informal rules are no longer followed in some communities. Furthermore, group behaviour (as reported by informants and observed at community level), cannot be expected to realize positive outcomes in the face of factors which undermine positive group behaviour such as the unavailability of, or the inability of people to pay to access public toilets or pay for solid waste collection. This is in relation to perceived and actual behavioural control in line with the TPB.

Behaviour leading to pollution can be worsened when sections (a particular group of individuals) emerge from a group to exploit the inefficiencies in community collective action (such as some informal solid waste collectors). In other words, when group collective action collapses, some people may create more problems than others by their actions.

7.1.2.4 Influencing perceptions, attitudes and behaviour in order to control pollution

The investigation found that a good relationship between the city authority and house owners can facilitate law enforcement. This is important because a decision to arrest and prosecute polluters will be difficult to implement and sustain, since some aspects of behaviour which result in pollution are usually hidden. Such a decision therefore, would be unlikely to realize its intended results. People have to be accountable for their actions, but there should be some incentives (in terms of the city authorities responsiveness to communities' needs and priorities) not to pollute. The city authority's collaboration with communities can help define priorities for water and environmental management. Although urban water and environmental management is multifaceted, it is possible for the issues to be understood and actions identified to address them. The ability to implement recommendations aimed at responding to identified problems will determine success in water and environmental management.

Since people are very much aware of their behaviour which leads to pollution, it indicates that any intervention to educate people will not achieve its intended purpose. However, creating awareness about the provisions of the law on water and environmental sanitation will be useful. This is because in many of the communities, people expressed the need to apply sanctions to those who pollute. They also recognized the difficulty that confronts the city authority in this because most of the pollution is as a result of hidden behaviour (as indicated above). The investigation did not find any other intervention that can bring change in attitudes and behaviour if facilities and services are not available to couple other interventions (see recommendations).

The dynamic and complex nature of the urban and peri-urban environment requires that the city authority take steps to understand the water and environmental needs and their drivers in communities. This can be supported by non-governmental organizations or other research organizations. Though attitudes are underpinned by the social and cultural setting, the study did not find any correlation between attitudes and selected measured individual household socio-economic factors (such as household income, per capita household income, age, educational status, wealth scores). This reinforces the understanding that attitudes cannot be explained by only measuring selected socio-economic factors but a more detailed approach as has been explored in this investigation.

7.1.2.5 Explaining the process of controlling attitudes and behaviour

The investigation found that systems are generated at different levels to help control behaviour. The motives for such systems may range from responsibility to control pollution (city authority) or local concerns for community cleanliness and resource protection (community collective action). These systems can be embraced or undermined by the communities. The systems can be external to the community (city authority funded service provision) or internal (some informal service providers; community collective action). The cost and the efficiency of operation of these systems will determine whether people can access them or not. These will therefore constitute people's *actual* behavioural control in line with the TPB.

The research also found that attitudes and behaviour (as reported by informants) are believed to occur within the context of some control measures in the form of local leadership or external leadership (subjective norm in line with the TPB). A breakdown of locally accepted rules or collective action in some communities means that it will be difficult to control behaviour. Intragroup conflicts occur when some people abide by the community informal rules to protect the environment while others do not. This affects the peaceful co-existence of community members. A breakdown of community collective action implies that external support may also be relevant in restoring order in behaviour of community members. The community can cooperate with external bodies to correct negative behaviour or reinforce positive behaviour.

Furthermore, the provision of facilities and services can promote positive behavioural control (actual behavioural control). A passive approach to problems of attitudes and behaviours is not likely to positively influence people's perceived behavioural control (in other words people have to be actively motivated to change behaviour).

Community collective action is manifested in several forms; from occasional activities such as community members' clean-up exercises to local informal institutions aimed at influencing perceptions and attitudes and controlling behaviour. Functional community collective action will feed into the subjective norm (TPB) as people become more active in discouraging pollution. Through the activities motivated by collective action, perceived behavioural control can be enhanced [for example through awareness creation, communication, learning etc., people's confidence can be raised regarding their ability to fulfil particular behavioural requirements].

7.1.3 Organizational efforts in water and environmental management

This section presents how the research objective 3: ‘to investigate how organizations can promote community participation in urban water and environmental management’, was answered.

7.1.3.1 Organizational strategic planning and management

The research found that the absence of a consistent approach to the formulation and review of organizational strategic plans in the water and environment sectors affects innovations. This is because organizations will have to function with outdated strategies which are not able to achieve the desired goals. Political influence continues to stifle innovative approaches in the sectors. This is worsened by a lack of clarity in the different roles of organizations and therefore makes sector monitoring and accountability difficult.

Organizations in the water and environment sectors recognize the benefits of networking with other relevant organizations. This was indicated by the different networks they are involved in as discussed in chapter six. Organizations need to strengthen the process of receiving feedback from the public in their operations. Although in some organizations efforts have been made to reach out to the public, more could be achieved from community and organizational involvement in water and environmental management. Furthermore, good engagement with the public will allow any doubts and concerns about the services and operations of the organizations to be clarified.

The research found that two main conditions lead to high staff turnover in water and environmental organisations: dissatisfaction with remuneration and working conditions; and lack of ample opportunities to bring expertise to bear in fulfilling responsibilities. High staff turnover has the potential to slow down progress of the organizations in the sector. In general, mentoring of young inexperienced staff in the organizations requires improvement. This is particularly important for organizational change management.

Different aspects of organizational capacity come with strengths, weaknesses, opportunities and threats. It is possible for organizations to apply systematic methods to identify areas of their operations which can be improved regularly. Organizations in the sectors which will be able to implement the results of such an analysis are more likely to

create a culture of excellence which is important for success. If organizations actively work with all relevant actors, improvements in the water and environment sectors can be realized because they could complement one another.

7.1.3.2 Citizen participation in water and environmental management

The investigation found that citizen participation in activities of water and environment organizations is very limited. In line with Arnstein's ladder of participation, there is some degree of informing and consultation (which Arnstein called a degree of 'tokenism') which means that actual decision making continues to remain in the hands of the organizations. In terms of the degree of citizen control (participation, designated power, and citizen control— in line with Arnstein's categories) current organizational and institutional structure have not stimulated a higher form of participation where the citizens are very much involved in decision making relating to water and environmental management.

Since the relevant organizations have failed to delegate some power of decision making to the citizenry, there is 'self assigned power' to tackle their water and environmental problems or contribute to problem solving. This is in the frame of 'community collective action' (discussed above) which some communities rely on to protect water resources and to keep the environment clean.

Without necessarily intervening to take over locally 'self assigned power', relevant organizations or stakeholders can partner (that is some form of citizen control) with communities where collective action is employed in activities aimed at protecting water and environment, to empower them further. This community-stakeholder collaboration can allow the implementation of shared interest.

Currently, many water and environment organizations exclude the citizenry in decision making efforts. For this trend to be reversed, it will require reform in organizational and institutional behaviour to make them not only accountable to the state, but also to the citizenry. This holds the potential of ensuring that a higher degree of 'citizen control' is embraced. Any established partnership creates opportunity for citizenry involvement in monitoring by organizations in water and environmental management. This can improve the sense of involvement by communities.

7.1.3.3 Improving organizational capacity for transformation

The research found that through stakeholder engagements, knowledge about organizational activities in the water and environment sectors is disseminated. These relationships occur at various levels with different motivations (See section 6.2 where the interrelationships between some key organisations were discussed; and also section 6.3.3 indicating relationships with local, national, and international organisations; some supervisory, others based on collaboration). This has improved understanding about water and environmental issues, though there is still more room for improvement, and helped to complement stakeholder's efforts.

High staff turnover and lack of organizational memory implies that knowledge acquired by experience is not necessarily available for application to relevant problems. As part of organizational empowerment, reasons for high staff turnover need to be understood early and remedial action taken. Empowering organizations to transform themselves therefore requires that staff positions are sufficiently institutionalized such that once a member of staff leaves, any successor can have access to relevant processes that have been carried out to aid in continuity.

In terms of citizen participation, it is through communication that stakeholders hear and are also heard. Therefore it remains an important component of organizational capacity as well as citizen participation. It is through communication that stakeholders are able to make their case for consideration. Stakeholders have to understand the needs of the citizenry to know how to communicate effectively.

7.1.3.4 Adopting integrated water resources and environmental management (IWRM)

Stakeholder involvement, in line with the principles of IWRM, has been shown to be relevant for water and environmental management. When groups present issues from their own perspectives, this sheds light on various dimensions of water and environmental management. The degree of stakeholder engagement differs among communities and organizations, but overall it is the combination of the different roles and contributions from stakeholders that strengthens the integrated approach. However, it is also noted that stakeholder participation is likely to slow down processes of IWRM, especially when stakeholders get on board rather slowly and are not fully committed to the process.

Gender and participation in IWRM is an important issue because gender roles and responsibilities with respect to water differ, even in an urban environment. Different gender roles imply that men and women are able to offer insight into different perspectives and priorities on water and environmental management. Women and children continue to bear a greater burden of water poverty (particularly problems of access). Therefore, the views of both men and women remain important in water and environmental management.

In relation to the overall research aim (see section 1.3): to understand the contribution water makes to livelihoods of urban and peri-urban households; the factors influencing perceptions, attitudes and behaviour in relation to surface water and the environment, and to identify measures for promoting community participation in water and environmental management, the following overall conclusions were drawn.

The results showed that water dependent occupations are important livelihood options for households. They offer opportunities for households with low business start-up capital to invest and build their investment over time. The study identified the different socio-economic and cultural settings (such as availability of jobs, availability of market for products and services, participation of women, influence of parents on occupational choices of young adults, transfer of knowledge from parents to their children, etc.) which influence livelihood choices and decisions. Livelihood choices and decisions are to help people come out (or stay out) of poverty. The investigation established that people's constructs of wealth and poverty are grounded in their expected livelihoods outcome of improved access to water supply, more income, access to health care provision, and access to occupations, access to shelter and other household consumables, among others.

However, pollution limits the potential of surface water sources for livelihoods. The study has improved the understanding of both the human and institutional factors responsible for surface water pollution. It identified the factors influencing perceptions and indicated that, with the aid of the five human senses, people are able to apply their knowledge and skills to come up with a qualitative judgement on the suitability of water for particular uses. People's perceptions, attitudes and behaviour towards water and environmental quality are related to the quality of sanitation and solid waste management. It is further influenced by the availability of facilities and services, the

ability of people to afford the cost of using these facilities and services, as well as the general influence from the communities in which people live, to either pollute or not. Thus, there is an opportunity for city authority to collaborate with the society to address these causes of water and environmental pollution. In doing this, the unique role of men, women, and children in water-environment relationships should be considered. The study indicated that it is incumbent on the city authority to explore the socio-economic factors influencing the water and environmental problems and respond to them. Furthermore, if the city authority will collaborate with key organisations in the water and environment sectors, they can respond to the existing problems. Different organisations have different capacities to do their work. The study showed that organisations in both the private and public sectors need to develop their capacities to enhance their performance. Success in water and environment interventions is more likely to be attained if organisations involve local authorities and their people to address problems, since community collective action holds good prospects for responding to water and environmental problems. To involve communities requires that their knowledge and practices are explored, understood and applied to address identified problems or for interventions.

7.2 RECOMMENDATIONS

This section provides details on specific recommendations to respond to problems identified in the water and environment sectors.

7.2.1 Expanding the city water supply system

The study found that the water supply system of the city lacks efficiency and because of that, many households have to depend on sources outside their houses for water (see chapter four). Therefore innovative approaches are needed by the state and the water company to expand the water supply system of the city. The search for capital investment in the water supply system should be coupled with organizational efforts that will improve the organizational culture of the GWCL/AVRL (for example the response time of the Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] to reported cases by people and identified breaks by the GWCL/AVRL on water supply pipelines). Modern technology that allows for monitoring pipe lines in order to detect water leakages should be explored by the GWCL/AVRL. This has the potential to improve efficiency in the water supply system.

7.2.2 Promoting favourable consumer attitudes and behaviour in relation to treated water use

The high per capita per day consumption of water by households accessing water at the PURC rate, as the study found, suggests the need for a programme by the GWCL/AVRL that will encourage responsible use of water. The GWCL/AVRL should also intensify the search for illegal connections and culprits dealt with according to the law. This will ensure that legal customers have access to water.

7.2.3 Promoting water dependent occupations

Many practitioners of water dependent occupations rely on water sources outside their homes and therefore their occupations are dependent on availability of water at these locations. Many of the occupations have the potential to expand. Promotion of water dependent occupations is therefore related to the efforts by the Ghana Water Company Limited/Aqua Vitens Rand Limited to improve efficiency in the water supply system. Practitioners should be encouraged by development-based non-governmental organisations so that they can expand their asset base through increased sales from their water dependent activities. This will require imparting knowledge to practitioners to help them improve the value chain for the activity. Non-governmental organizations which support small-scale ventures with loans are encouraged to consider a package for operators of such enterprises. However, before this is done, there should be some effort by the respective organisations to understand the needs of the market. This will make it possible for the organisations to assess the time frame for beneficiaries to repay the loan. Water dependent occupations hold prospects as avenues for poverty reduction.

7.2.4 Pro-active enforcement of laws and application of policies on sanitation and solid waste management.

Access to sanitation

The study found that there were problems of access to sanitation and solid waste disposal services in the communities. Furthermore, standards of hygiene in public toilets were perceived by community members to be low. Therefore it is important for the city authority to review its approach to the provision of sanitation services and enforcement of laws on sanitation at the household, community and city level. Pro-active enforcement of laws presents a way of applying the law to ‘wake up’ people to their responsibilities in relation to provision of household toilets, appropriate handling of

solid and human waste and general attitude to the environment. It calls for context specific approaches to applying the law with an in-built monitoring system on enforcement practices, in which there is periodic assessment by the law enforcement authority on progress made by communities in terms of meeting the requirements of the laws. Law enforcement should be made part of a bigger process aimed at preventing pollution and protecting the environment. A proactive enforcement of laws on sanitation will ensure that constructors building in new residential areas are incorporating toilets in houses.

It is important that enforcement is strengthened, accompanied by awareness creation by the city authority to get the cooperation of households. Awareness creation and law enforcement can lead to a healthy and cooperative relationship between the city authority and the community. Awareness programmes could also simplify and explain the relevant laws to the communities. The collaboration with the community will enable the city authority to urge landlords or property owners to ensure that there is a toilet in their houses and also communicate to them [landlords] the consequences of failing to follow city regulations.

Household and community levels

At the household level, the cost components should be defined and private companies invited by the city authority to offer a form of sanitation credit to households that cannot afford the cost of constructing toilets which could be re-paid over a period. The way forward for each household or community can therefore be customised to their specific needs.

Although the ideal is for each household to have its toilet, it will require reconstruction of many parts of the city to make that possible, because of lack of space and capacity of households to afford construction of toilets. Until that happens, other options must be considered that avoid exposure to human waste and allow households to have access to decent sanitation and a clean environment. Since many households lack toilets, public toilets continue to remain the most viable option for sanitation and they constitute the main sanitation facility for the majority of residents in the city presently.

Therefore at the community level, the current system of city-private partnership where the city builds the public toilets and private individuals bid to manage them, should be

reviewed by the city authority to ascertain how best to make it affordable and improve access to low income households, while maintaining high standards of hygiene. More private individuals should be encouraged to invest in the provision of toilets at designated sites based on standards of design, construction and management established by the city authority. This can help improve access and affordability.

The city authority should consider the criteria for siting of public toilets, so that they pose no public health risks. Of equal concern are the standards to which these public toilets are managed. In relation to this, the Accra Metropolitan Assembly [AMA]-Public Health Department and the AMA-Waste Management Department of the city authority should collaborate with key organizations such as the Ministry of Health, and the Environmental Protection Agency, as well as the communities, to make known the necessary guidelines for siting, management and use of public toilets to both the operators and the communities. Both users and operators will therefore be responsible for maintaining a hygienic environment to reduce health risks to operators, users and the public.

City level

At the city level, there should be a strategic plan on specific actions on sanitation and environmental pollution control spelled out conspicuously in the Medium Term Development Plans of the city. The Accra Metropolitan Assembly-Public Health Department and the Waste Management Department should then monitor their operations to ensure compliance with guidelines.

Solid waste collection service

The low capacity of the waste management companies in terms of logistics to cover so many households, inability of people to pay, or lack of willingness to pay, has made it difficult to establish services for some households in locations where they are expected to make individual arrangements for solid waste collection services. In locations which benefit from city funded collection, full bins are not emptied on time, creating a public health risk to residents. Secondly, the bins are not sufficient to cover the entire population. Since the services of the formal [licensed] private companies are demand driven, the city authority should encourage community members, as much as they are able, to sign on to private companies who do the collection.

The formal private companies also have a responsibility to encourage more households to sign on to their services because the more customers they have, the more income they bring in and thus enable their operations to remain economically viable. The city authority could also come up with some incentives for companies that can show evidence of a certain level of coverage, to encourage them to do more to get people to sign on to their services. The other option would be to define paths through which private companies can be supported to improve their logistics and a regular percentage of their payments from the city used to defray the cost of the support package. The solid waste collection process of the private formal companies, if strengthened would go a long way to support the whole solid waste collection system.

A review of the private companies is important to ensure efficient waste management. However, it is important to note that it may be difficult if the city is indebted to these companies. This calls for innovation and for the city to plan in the short, medium and long term on how waste is going to be managed in the city, particularly against the backdrop of rising population and therefore increasing waste volumes in Accra. For instance, where poverty indicators have improved, the city can gradually wean off communities from dependency on free services, to a 'pay as you dispose system' where specific companies are assigned communities to collect solid waste, receiving payments for their services, either as people dispose of waste or through a monthly subscription system.

In relation to formal public collection services, in some locations the city authority has contracted private companies to collect at no fee to the community members. However, it does not appear that this is the city authority's preferred approach in communities where it is presumed that a majority of households should be able to afford collection services, such as communities with high infrastructure provision. In some instances, community members are made to pay before disposing solid waste [as discussed in chapter five], when they are not supposed to. It should be possible for the three parties – the city authority, the waste management companies and the communities to dialogue on the illegal fees being paid, such that a way out would be found and no individuals would be excluded because they cannot afford solid waste disposal charges. This could also be extended to areas where legal fees are paid, but considered expensive by community members.

Informal solid waste collection

There are also the informal small-scale collectors [as discussed in chapter five]; the city authority could consider mobilizing them and developing their capacity to the extent that they will contribute to the waste collection and disposal efforts and not pollute the environment through their activities. These informal collectors operate in several parts of the city and they can contribute to the waste management system. This is because households which cannot afford, or do not want to commit themselves to a monthly subscription could rely on the services of these informal collectors since their rates are based on 'pay as you dispose'.

If informal small-scale collectors are integrated into the solid waste collection system their activities could be controlled. Controlling the activities of informal collectors will help address the negative aspects of their operations so that they can make positive contributions to the quest for a clean and a healthy environment for socio-economic development. It also provides a viable occupational opportunity for people. If the city authority succeeds in reorganising informal collectors and building their capacity, they could possibly team up with major collection companies to manage solid waste within the city.

Strengthening monitoring of solid waste collection services

The city authority should also strengthen its monitoring system to identify and address the above problems in communities. This will make it more pro-active in its operations and governance. This will show if registered solid waste management companies have adequate logistics for their operations. The monitoring team of the city authority's Waste Management Department (WMD) will need innovative approaches to identify contractors whose services are poor and follow due process to apply sanctions.

The community must also be involved in the monitoring process. This can be done if the city authority identifies trusted persons [this can be a responsibility of community watchdog committee members] in the communities who will keep records of information on basic indicators which will be collected at specific times. In the age of information communication technology, the information can easily be received via text messages or calls. The cost elements can be worked out with telecommunication

companies. Participatory monitoring of solid waste collection services will ensure a win-win situation for all parties involved in the disposal and collection efforts.

The issue of pollution is not the sole responsibility of the city authority, but the city authority must offer good leadership and ensure that all relevant organizations which have a part to play in keeping the city clean and healthy, do so in collaboration with the communities. This calls for dialogue and interaction and sharing of responsibilities and participatory monitoring of the respective organizations. There are currently several platforms on water and sanitation in the city including the Accra Learning Alliance which was borne out of the SWITCH (Sustainable Water Management Improves Tomorrow's Cities Health) project which can help in the dialogue.

7.2.5 Surface water protection and wastewater channel management

The research found that wastewater channels in the city are not efficiently designed because they are not able to allow wastewater to flow. The problems of flow are also worsened by the presence of solid waste in the channels. Therefore appropriate expertise is required to aid in the decision making process of urban and peri-urban development. The city authority should ensure that organizations with the mandate and the expertise to design and construct wastewater channels and culverts are allowed to do so. This involves the Hydrological Services Department (which has expertise for designing wastewater channels and culverts), the Accra Metropolitan Assembly-Town and Country Planning Department, the AMA-Planning and Coordinating Unit [which is responsible for the overall coordination of city development plans and implementation] and others. This is important because discharge of wastewater from houses into the environment has to be controlled in order to protect the surface water resource. The situation in Accra in which wastewater channels are unable to transport wastewater because of engineering design defects and also presence of solid waste can be avoided in emerging residential areas. This will ensure efficient and wise use of limited resources.

In relation to the management of wastewater channels in communities, the AMA-Waste Management Department has a role to play. Maintenance of the channels in communities should be carried out in collaboration with the members of the communities who may have existing arrangements (such as watchdog committees) for cleaning open spaces and channels in the community through communal labour.

Enhanced city-community collaboration will help to address the problems of blocked channels in the communities. This is expected to lead to a reduction in inflows of waste into the river system, such that water quality might improve over time.

7.2.6 Urbanization and land management

In chapter five, it was indicated that people have built very close to the banks of the river channel and how many parts of communities lacked planning. In the peri-urban communities, the district assembly should enhance its efforts by ensuring that planning layouts are followed. Here the district assembly should collaborate with the Water Resources Commission, Environmental Protection Agency, Ministry of Water Resources, Works and Housing and the District Planning Department to ensure that the river and its banks are protected from housing construction. The collaboration will also ensure that structures that interfere with the flow of surface water are removed. When the issue of river boundary buffer zones was raised with the Water Resources Commission; this is what the key informant said:

“The Commission is leading the promulgation of appropriate legislation to respond to this current challenge”.

In Accra, this calls for the city authority to consider a progressive reconstruction programme for its communities through an effective planning process. The Accra Metropolitan Assembly - Town and Country Planning Department are key in the planning process.

7.2.7 Advocacy and organizational roles in the water and environment sectors

Organizations involved in advocacy should campaign for the independence of the key organizations in the water and environment sectors. This will enable them to distance themselves from political interference which has the capacity to undermine the objectives of the organizations. Removal of political interference will ensure that the decision making process is balanced to the extent that-people, planet, and profit elements of sustainability are incorporated.

Organizational roles in respect of specific water and environmental issues should be made more distinct by the state. This will allow the public and other organizations to demand for accountability and responsibility in the sectors. The city authority should also work with such organizations to promote lessons in communities. It should

promote engagement between the relevant organizations in water and environmental management and the community. Such collaboration will ensure that there is ownership and participation in water and environmental management initiatives.

This platform will serve as an opportunity for organizations to package information to the public as well. This will call for organizations to improve on all communication and information dissemination and management, particularly updating their websites with current and relevant information. Such an engagement will help respond to public disillusionment about the roles of the organizations in water and environmental management.

The Ghana Water Company Limited/Aqua Vitens Rand Limited [GWCL/AVRL] and the Public Utilities Regulatory Commission [PURC] need to explain clearly the water billing system to the public. Poor communication between organizations and the public can lead to problems in engagements. Therefore there is a need for innovative approaches to engage more with customers in this case.

Organizations such as the Coalition of Non-governmental organizations in the Water Sector [CONIWAS], involved in advocacy and education must team up with communities and the public to bring pressure to bear on government in relation to the inefficiencies in the water supply system. For state owned organizations, it is not every intervention that requires funds as some changes require an improvement in human attitudes to work and improving efficiency, as seen in the GWCL/AVRL attitude to illegal pipelines and leakages on pipelines [see chapter four section 4.1.1].

Furthermore, the city authority may have to liaise with organizations that have some role in shaping the attitudes and behaviour of people and civic responsibilities such as the National Commission on Civic Education, Environmental Protection Agency, Accra Metropolitan Assembly-Waste Management Department, Accra Metropolitan Assembly-Public Health Department, and Coalition of Non-governmental organizations in the Water Sector to promote interventions in response to this challenge (in relation to attitudes and behaviour leading to water and environmental pollution).

7.2.8 Organizational policy reviews

Organisations in the water and environment sectors have inadequate provisions to involve the citizenry in decision making and participatory formulation of solutions to water and environmental problems. They need to develop an institutional culture that would consider creating a platform to involve concerns from communities to ensure that its members are actively involved in management. This will link also to the efforts of city-community collaboration (discussed above). Organizational and institutional policy should factor in the urban and peri-urban context, through systematic research to create a conducive platform that will integrate citizen participation in water and environmental management.

The evidence also pointed to a gap between what the nation has stipulated to be accomplished and what is actually accomplished in a particular period. For example in the Ghana Water Policy, pages 14 and 15, it is clearly indicated that the nation will work towards:

‘Achieving sustainable management of water resources; and ensuring equitable sustainable exploitation, utilization and management of water resources, while maintaining biodiversity and the quality of the environment for future generations’.

These objectives are yet to be realized. A statement from the Ghana Poverty Reduction Strategy II (NDPC, 2005:112), throws light on progress in access to water, indicating that efforts to improve the proportion of the Ghanaian population with access to safe drinking water continue to yield positive results, although at a slow pace;

Access continued to improve in both rural and urban communities in 2006. The percentage of rural population with access to safe drinking water increased marginally from 52.0% in 2005 to 53.18% in 2006; access was much better for the urban population, which increased from 55% to 56.0% during the same period under review.

This points to the need for stepping up of organizational, individual, community, and city efforts in ensuring that the city has access to safe water, clean environment and decent sanitation.

7.2.9 Adopting integrated approach in water and environmental management

The study found that though there are some efforts by organisations in the water sector to network, the full potential of Integrated Water Resources Management [IWRM] is yet to be realised. In line with the principles of the process of IWRM, the integrated

approach adopted in the investigation is still relevant for today's water and environmental management as there is still a need to conserve and protect our water resources. Participatory approaches to water and environmental management broaden understanding of issues and offer various perspectives. The fact that relevant stakeholder interests are considered helps to reduce potential resource use conflicts that might undermine water and environmental management. The unique role of men and women in water and environmental management suggest continuous gender inclusion in the process of IWRM. Water continues to be viewed as economic and social good and the future will require an equitable balance between these two concepts. Water and environmental management should therefore continue to adopt an integrated approach.

7.3 LIMITATIONS OF THE STUDY

In order to achieve the objectives of the study, key questions were formulated and efforts made to respond to them. In responding to the questions, specific theoretical frameworks, tools and approaches had to be explored and applied. Some of the theoretical frameworks and tools employed had limitations and therefore had to be complemented with other tools or methods. In some instances, the approach used implied that the researcher had to be aware of its operational limitations. This is important in placing the findings in context.

7.3.1 The Sustainable Livelihoods Framework (SLF) and qualitative research methods

The Sustainable Livelihoods Approach (SLA) and the Sustainable Livelihoods Framework (SLF) that underpins it, provide guidelines for understanding the livelihoods of households. It helps to explore the different resources available or on which households draw. The SLF conceptualises these resources in the form of assets- human, social, natural, physical, and financial. Through this analysis, understanding in the multi-dimensional nature of poverty is improved. Furthermore, the SLF is useful in helping to understand the fact that both internal and external factors are responsible for the opportunities available to people.

However, although the SLF is able to guide on what to study, a range of complementary qualitative and quantitative research methods are required in order to understand the social processes and socio-economic and institutional conditions in a particular locality, or the study area in this case.

The SLF identifies the different types of assets on which data should be collected, but it lacks sufficient guidelines on how to convert data to a form that can be compared and interpreted. It does not provide standard procedures for quantifying all human and social assets or standard indicators for wealth and poverty ranking. The SLF has to be coupled with other tools, both qualitative and quantitative.

Qualitative research methods are able to help explore people's constructs of wealth and poverty which are not ordinarily conspicuous in data. In exploring perceptions, attitudes, and behaviour, qualitative methods were useful for explaining or understanding thought processes and emotions which are difficult to achieve through quantitative research methods. It was also useful for investigating organizational capacity for water and environment sectors. Thus, the qualitative method enabled insights, to be derived from the data.

The combination of the SLF with the PCA shows that understanding of poverty can be improved if multiple dimensions are explored, allowing quantification of assets and comparisons across different groups.

7.3.2 The Theory of Planned Behaviour (TPB)

Though there was mention of attitudes and behaviour specific to particular communities, specific planning indicators (in relation to sense of place and identity) will be required to investigate this further before any conclusive statements can be made, since the TPB did not have sufficient guidelines on how to respond to place and behaviour relations. In spite of the usefulness of the TPB, it provides insufficient tools for understanding the social and economic context within which behaviour happens and therefore other methods have to complement it. The combination of the SLF with the grounded theory approach helped to investigate the social aspects of the interest population. The process of generating ideas and themes from data, as suggested by the Grounded Theory was particularly useful to complement this theoretical limitation. The use of questionnaires and their analysis was also able to help explore the economic components of the research.

7.3.3 Triple Bottom line Principle and Principles (TBL) of Sustainable Development

In relation to this research, both the TBL principle and the Principles of Sustainable Development support the need to promote policies, institutions, and organisational efforts in water and environmental management. Particularly, they call for organisational approaches and accountability in resource use and management to ensure sustainability. Thus, the analysis considered various key organisations in water and environment sectors. However, the knowledge from these principles had to be complemented with key informants' interviews to unravel the relevant issues confronting water and environmental management.

7.3.4 Principles of Integrated Water Resources Management (IWRM)

In relation to this investigation, the principles suggest that efforts at managing water and environment sectors should seek the involvement of relevant key stakeholders. This is important because it will help enhance the prospects of success in interventions. This was particularly useful for the investigation as it justified the involvement of different groups of stakeholders in the investigation. In reference to this research, the key limitation which emerged was the slow response by some stakeholders to get involved in the process. Many attempts had to be made to reach out to stakeholders. It was a time and resource consuming process in this case. In the research, the process started with the stakeholders who showed commitment and desire to be involved at the beginning of the process while persistent efforts were made to involve others in the course of the process.

7.3.5 Focus group discussions and key informants interviews

The focus group discussions depended on the knowledge and the issues which people could recollect and share. It is possible for issues to have been exaggerated. This was addressed by triangulating in other communities and with different groups. This is where the mixed method was very useful as it helped to measure some of the issues which emerged from the qualitative study.

The process of key informants' interviews within organizations in the water sector was unable to provide details on more sensitive issues. Organizations are very cautious about sharing sensitive details, especially relating to finance and staff reward packages.

7.3.6 Questionnaires and the Principal Component Analysis (PCA)

The questionnaires employed in the study were very useful in complementing the qualitative methods. The questionnaire survey helped to measure and analyse the quantitative components of issues which were generated from the qualitative data analyses. The use of the questionnaire had to rely on the oral responses of people drawing on their knowledge and what they could recollect during the period. Income values were reported. Asset ownership was mentioned by respondents as it was not possible to go into individual rooms of respondents to take an inventory of what people owned. The volumes of water used by households were estimated either by the number of buckets used per day in the case of those buying water at private charges, or for those obtaining water at the PURC rate it was estimated from the monthly bills paid excluding any known arrears.

The PCA is sensitive to the sample size, and it is suggested that a sample size of 300 and above is appropriate for a good analysis. Since the sample size in this investigation was 443, this limitation was addressed. The PCA is conducive for analysis where the underlying structure of the data is known. In this case the underlying structure was wealth distribution within the population. The PCA works best when asset variables are correlated and the distribution of variables varies across cases. Based on the objectives, the user has to decide the number of principal components (set of weights to use) to present the different clusters of the underlying structure (in this case wealth, and two components were found relevant). Since more than one principal component is used, it means that the underlying structure cannot be represented by a single value. The choice of variables used can affect the results. For this, SPSS defines a series of steps which allows the user to leave out variables that are poorly correlated with the other variables. The difficulty in understanding the strength and form of relationships between variables made it necessary to carry out many tests on relationships.

7.4 FUTURE WORK

The study set out to respond to three key research questions in water and environmental management. For each question, sub-questions were also formulated to help answer the key questions. In the course of exploring and also investigating specific areas, some issues emerged which fell outside the focus of the research questions or the reach of the tools used, and yet further information or knowledge on them will broaden further the

understanding of urban water and environmental management. The issues are outlined below, indicating also how they emerged from the study.

7.4.1 Further study on community associations

A further study of community associations which are involved in water and environmental management will deepen understanding of how some have achieved success and why unsuccessful ones have suffered failures. Detailed investigation of the representation, composition, decision making, motivation, and implementation of community initiatives will provide additional knowledge for the city authority in the process of engaging with communities and for organisations who want to encourage formation and strengthening of such associations. This should be linked to how provisions in the planning process to involve communities will be operationalised in the city. This will help to generate the knowledge to encourage active community participation in the planning process. It is expected that the study would generate further ideas on how the catchment might be protected to improve water and environmental quality with community involvement.

The findings of this study showed that there are community associations in some of the communities that have contributed to water and environmental management. Assessment from the available information showed that there is a lot of potential in these associations, usually called community ‘watch dog’ committees, to partner with the city authority and other organisations in water and environmental management. However, the results obtained from the study were insufficient in telling a complete story in this particular area; thus, there is a need for further investigations.

7.4.2 Study considering direct observation of households’ behaviour

Further research which considers direct observation of household’s behaviour in relation to solid waste and sanitation practices could throw further light on the understanding of urban environmental behaviour. The study extensively explored perceptions, attitudes, and behaviour (reported behaviour) and how they influenced water and environmental resources. The behaviour component was largely based on reported behaviour as experienced by community members and researcher observations during field work. In line with the theory of planned behaviour, this has helped to shed light on the perceptions (beliefs), attitudes, and behaviour and therefore have largely been able to

explain what is happening in the communities. However, it was observed that several factors actually determine what behaviour will be demonstrated under different conditions. Therefore a study that might consider direct researcher observation as opposed to reported behaviour, may present knowledge on dimensions which the reported observations may have missed. This may also allow for some comparison.

7.4.3 Role of sense of place in protecting water and environmental quality

A research on the relationship between perceptions, attitudes, and behaviour in relationship to the TPB and a sense of place would add to the body of knowledge on how people might be influenced to change their behaviour. This would investigate the relationship between the social processes and particular place-related issues in the communities and how these offer people a sense of belonging to the community or their physical location. A sense of place implies that people will feel proud to identify themselves with the communities. The research could investigate the nature of the restraining factors which the influence of society accords when it comes to influencing community members' behaviour. The study grouped communities into different categories. In the high infrastructure provision communities, people felt pride in their communities, for example when some talked of refusing to allow a public toilet or solid waste collection bins to be placed in the community because they are usually associated with low income communities. In the other communities some people were really not concerned about what happens to their communities whereas others wished that the problems could be solved. The issue of one's community, and whether the residents are proud about it or not, and therefore act in ways to pollute it or otherwise, was not a direct focus of the research questions and therefore not answered by the investigation. Yet this holds the prospect of adding to the body of knowledge to explain how people's behaviour might be influenced in the area of water and environmental quality.

7.4.4 Exploring methodologies to investigate sensitive information from organisations in water and environmental sectors

Exploring methods that help to generate information on the more sensitive issues within water and environment organisations, such as finance (and issues related to corruption) and others will help improve understanding of organizational dynamics. This will ensure that any known loopholes exploited to siphon funds illegally from organisations are sealed. Existing methodologies can be tested while new ones are generated. The role of organisations has been discussed in the preceding chapters. For organisations to be

able to act accordingly, they must have the needed capacity and resources. If government is to intervene with the appropriate measures then the true state of the organisations has to be known. This may be difficult to know if people weigh the consequences of sharing such sensitive information which may sometimes implicate the organisation in for example, corruption and other forms of abuses and failures.

The study was able to unravel and offer explanations for many aspects of organisational capacity and resource needs. However, the method applied could not provide information on the more sensitive issues as indicated above. Therefore a methodology that can assure the organisations of their confidentiality and also let them present information on sensitive issues in the organisation may help further understanding of organisational capacity needs.

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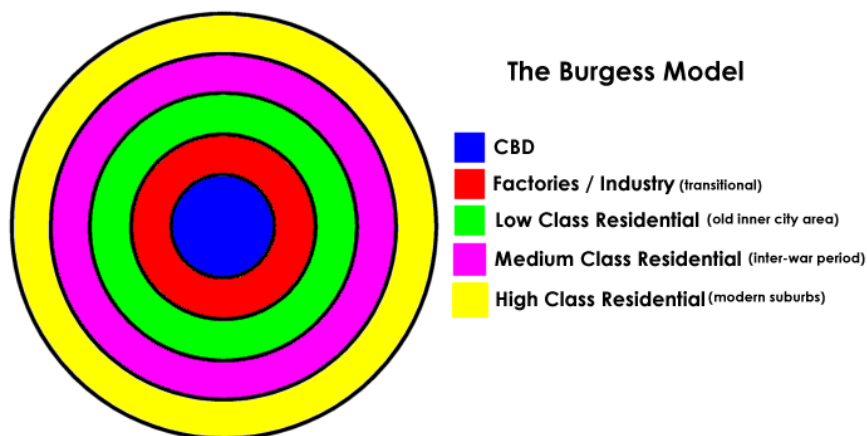
APPENDIX 2.1: CITY MODELS

The concentric ring model

In line with Burgess' model (Figure 1) of the city; variations in income may lead to a sorting out of income groups. Different groups of people move to the periphery of towns and cities. Often disadvantaged groups trapped by circumstances remain in problem areas of inner city areas. This is because their inability to move could be as a result of inability to afford housing in the periphery of cities or they are being discriminated against by the housing market. Burgess was concerned with the influx of people into the city and the problems associated with the dynamic growth of the city which ensued from this continued influx. Out of his investigations in movement by people into urban centres, he emphasized the important processes of invasion and succession, concentration and deconcentration which occurred as incoming migrants sought to live close to the city, the economic, social and political heart of the community. According to Daniels et al., (2005), Bugess (1924) argues that the city grows outward by a process of accretion as particular groups or classes segregate themselves from others whose lifestyle are very different and considered inferior. This model has been challenged by many geographers as not working well even in the USA let alone cities outside the USA (Daniels *et al.*, 2005).

In the case of Accra, the highly commercial zone shifts to the Accra Central Area. Beyond this there is a mix of both commercial and residential, then into more residential areas close to the boundary of the city.

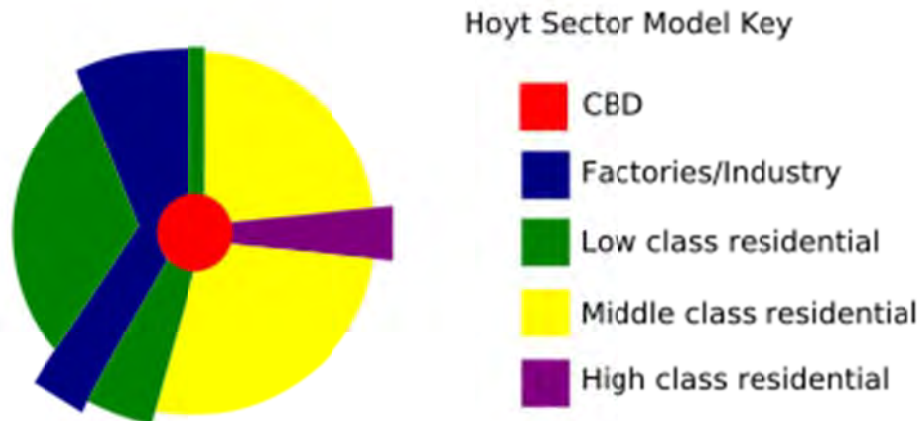
Figure 1: The Burgess Model [CBD means Central Business District]



Hoyt sector model

Hoyt (1939) introduced the idea of sectors to Burgess' concentric rings in zoning urban places (Figure 2). He based this partly on the fact that there is unequal access to the city, with main routes being favoured and therefore attracts wholesale and manufacturing activity along them while low-class housing for the workers are located next to the zone. His zonation was also partly based on the recognition that once a certain class of residential area had been established in a city, it would over time attract accretionary growth of similar residential housing, thus extending the zone out as sectors (Daniels *et al.*, 2005).

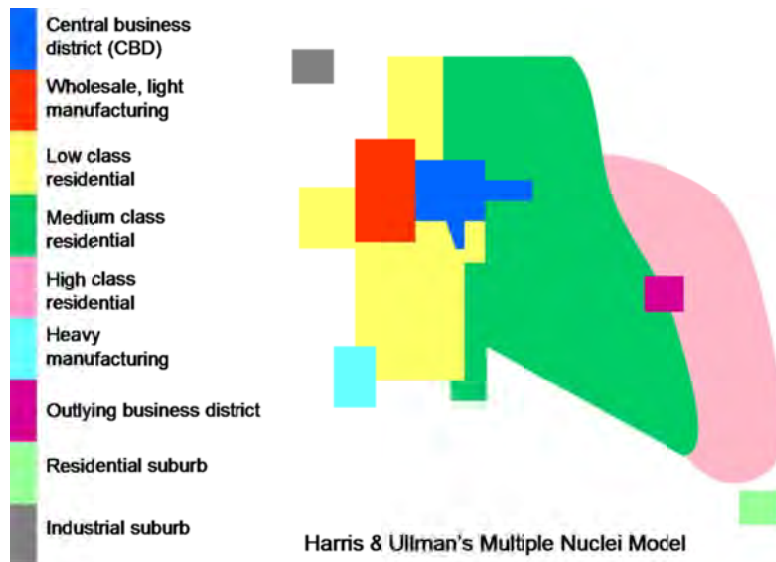
Figure 2: Hoyt Sector Model



Ulman and Harris multi-nuclei model

Ulman and Harris recognized that growth might occur around the main Central Business District and also around sub-centres. Working as they were at a much later date than Burgess and Park or Hoyt, they were also able to include since in their observation some usages could not find sufficient space nor afford the cost of development at the centre of the city (Daniels *et al.*, 2005).

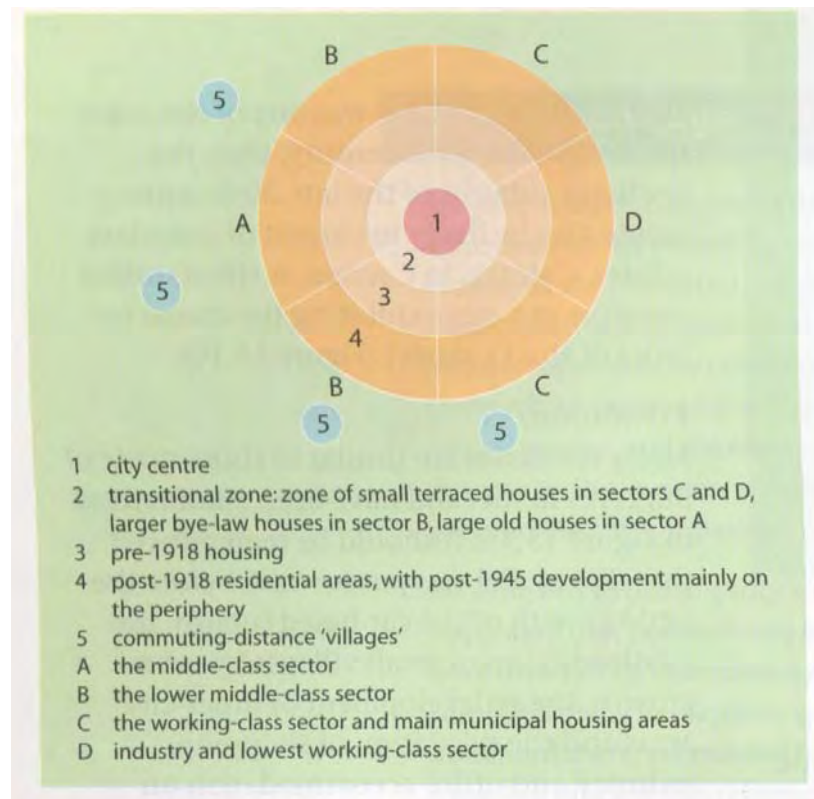
Figure 2.3: Harris and Ulman Multi-nuclei Model (1945)



Mann's model for British cities

Mann has attempted to use the ideas of Burgess and Hoyt in constructing a model which could be applied to British cities. In addition, he allowed for the effects of westerly prevailing winds, encouraging higher income groups to live in upwind of the smoke and grime from industry near the centre. He also allowed for the rather different housing sectors present in British towns compared with their American counterparts (Daniels *et al.*, 2005).

Figure 2.7: Mann's model for British cities



Limitations of the models

As in the case of central Place Theory discussed, model makers had to make certain assumptions which are not necessarily accurate in reality, for example, the assumption that the city developed on flat (isotropic) surface with accessibility equal in all directions away from the city centre. This does not happen in the real world. Another assumption is that the location of a particular type of residential zone depends on the different ability of various income groups to afford the most desirable locations. While the less wealthy have to accept the less desirable locations which higher income groups do not want. In the real world however, many other factors may influence this for example, local or city authorities may acquire land for the development of housing in more desirable locations such as semi-rural areas on the edge of the city. This may then be allocated to lower income groups which otherwise may not have been able to afford such a location (**Daniels et al., 2005**).

APPENDIX 2.2: LAND USE PLANNING AND MANAGEMENT PROJECT AT TOWN AND COUNTRY PLANNING DEPARTMENT (TCPD)

Land Use Planning and Management Project at TCPD [source: These excerpts are taken from the TCPD and LUPMP (2011)]

Spatial planning in Ghana is to be restructured under the new Land Use Planning and Management system, a result of the Land Use Planning Management Project at the TCPD [National office] under this arrangement; the following shall drive forward spatial planning.

Information System [IS] Concept

Spatial planning at community level

Spatial land use planning includes the **identification of areas with their characteristics, their potentials**, their needs and their constraints, and the spatial expression of land use pressure. The output is a **structure plan**, or definition of **land use zones**. Planning, from the IS point of view, is the process of combination of input data (current land use, orthophotos, cadastral maps, base maps, economic factors, ecological aspects or maps), combined and filtered according to a set of rules (planning guidelines, policies, law) in an iterative, participatory decision-making process to come up with new land use pattern.

Many of these characteristics can be expressed with their geographical extension, i.e. on maps. (The link to quantitative assessments, such as with socio-economic data, for a combined planning approach, is to be maintained). Expected GIS output is not only maps showing the current and future land use at the various stages of the land use planning process, but also maps for use in overlays with simple overlay algorithms (point / line / area buffers, excluding zones, cutters, merge, overlap, combine, join, intersect functions), though not based on numeric formulas. Links to external database [DB] or complex DB relations are not required, unless a land characteristic model with land use requirements is to be performed in a later stage. Therefore, only attribute tables will be used.

Definition and layout of sector maps

The Town and Country Planning Department is expected to have a system for drawing (tracing) basic line maps with the outline of sector layout, i.e. large-scale maps with parcel lines, individual plots, roads, utilities etc. These maps, normally at a scale of 1:2,500, have to be scalable within a certain range (0.4-10 x), a limited overlay will be performed (contour lines, roads, hydro, raster photos, images), but no modelling or 3-dimension [D] are required in the early phases.

Spatial extension or statistical functions are required only to the level of calculating areas of individual plots (polygons). Initially, a link to textual data is planned to basic, internally relational attribute tables, but not to an external SQL-based DBMS (Data Base Management System). In a later stage, a link will be established to a parcel-based DBMS being set up first within Land Use Management Information System [LUPMIS], in later stages to other LSAs through VPN or other web-based protocols. The main emphasis in this activity is on the ease of use and speed of graphical retrieval of maps (plotting and on-screen), ease of textual retrieval in the later stage, together with ease and error-control of data entry, and an integrated data QC (Quality Control) scheme. These are all basic GIS functions. The challenge is the manpower (training of computer-

illiterate staff on a very broad basis, some 50-200 staff members), the maintenance of hardware, software and data, and the connectivity.

Development and building permits

A third information system output, which has been requested informally, is a **textual database** to monitor the status of (development and building) **permit requests**, which is currently one of the main activities of Town and Country Planning Department [TCPD]. This database management system will include textual-graphical linkages, the GIS. Such a database, once developed, will be installed and deployed in all the offices of the TCPD. Hardcopy of permits should be stored in the office only for documentary purposes. All processing and issue of permits should be handled electronically. Conceptual procedures might have to be revised at the head quarters [HQ] of the TCPD. They will then define the processes, to be coded (programmed), and tested at beta site. After positive evaluation and successful tests, this system can be installed at all pilot communities, for later dissemination in additional TCPD offices. It will start as a server-based application on the local LAN, later with a backup and mirror server at HQ. It has to be discussed, if the approach to this Permit Database will be in one phase (directly having the approving system done electronically, with hardcopies only for documentary purposes) or in two phases (first, a tracking system maintaining the conventional hardcopy-based approach, later replaced by the electronic approval system). In the long term, this will be replaced by the one-stop-shop approach, where all parcel activities will be coordinated through LAP with all concerned LSAs through NLIS.

Land use monitoring

An additional function of the information system will be the support of land use monitoring, as carried out by the TCPD. This will consist of an **overlay of the approved land use** (planned and approved land use) **with newly assessed land use** (current land use) to identify areas, where land use has changed either in terms with the approved plan or illegally. In summary, the districts have the function of collecting, entering, and storing the data, applying simple GIS analyses such as overlays, preparing the output (maps, statistics), i.e. the 'bulk' of work. The **regions** have the function of coordinating and to quality-control the planning - and data- activities in the districts. The **HQ's** mandate is to develop new system modifications, collect data through the national access, and to deliver technical backstopping and advice.

Flow of GIS activities

- 1. Collection of digital GIS data**, both at HQ level and at local level: Contour lines and other topographic maps, hydrology (as lines and as polygons), administrative units (as lines or as polygons), geological maps, road / transportation units, etc. These are to be quality-controlled, checked for their scale, fit for their adequacy of information, checked wherever possible for their coordination and quality. These digital input maps should be in geodetic reference (latitude / longitude), always based on WGS 84, and in ESRI or other compatible format (shp file or E00 format).
- 2.** In particular, **orthophotos** or other available aerial photos (recommended: low flying, digital aerial scanning with high resolution, high quality, easy, cost-effective) or satellite **images** (easily available, very cost-effective, cheap) should be integrated into the information system. Amongst other, they will

serve as the basis for land use mapping. If not georeferenced (or georeferenced in an incompatible system, ground control points have to be identified and image to be georeferenced accordingly).

3. **Collection of data from field surveys**, in most cases by GPS: Also, these data have to be in latitude / longitude, based on WGS 84. They can be either recorded in hardcopy (field book) or in digital format (GPS log file, 'route', waypoints, preferably in gpx or kml format or simple ASCII).
4. **Land use mapping** and delineation will be carried out by trained staff at district level. Homogenous units will be identified and traced both in the office and in the field, and described in the field. A land use classification system will be available and serve as the basis for land use description.
5. **Digitization**, mainly at district level: The delineation of these land use units will be entered into the GIS, by on-screen digitization of lines, which are transferred from the hardcopies, where they had been traced first. Alternatively, orthophotos with land use lines can be scanned, and then digitized from there. Only after sufficient experience has been gained, can land use units be directly identified on-screen and traced straight from the images. A large number of sector layout maps has to be transferred from conventional prints to digital format, by scanning and then 'vectorizing' (digitizing). This is done at the beginning at HQ, in a later stage, when more scanners are available, also at the Regional level.
6. **Plotting** is the main hardcopy output of the GIS system, at all levels. Standard routines will be developed to speed up the production of plots with templates and standard layouts, including index map, legend, scale bar, grids, title, sheet number etc. At this stage, it is not envisaged, to print maps in standard series.
7. Combination of map layers with functions of intersecting, combining, excluding / cutting, etc as the basis for **GIS overlays**, for land use plan preparations at the district level, for QC at Regional level, and for some data compilation and preparation at HQ level.
8. Entry of building and development permits into the **Permit Database**, storage and retrieval.
9. **Maintenance of the computer system**, at all levels: Hardware has to be maintained, repaired, cleaned, replaced if necessary; software has to be installed and upgraded; data have to be fixed, copied for HQ and backup, etc.
10. **Quality-control**: An important activity to be carried out both at the district level and at a higher level (first HQ, later Region). Data entries have to be checked for errors, coordinates have to be field-checked, data accuracy has to be assessed and communicated to the users, the system has to be validated, procedures have to be revised, output has to be questioned and discussed with feedback returned to the developers.
11. **Metadata** and full documentation will be added to each new set of data.

APPENDIX 3.1: COMMUNITIES OF ACCRA [SELECTED COMMUNITIES HIGHLIGHTED]

Number	Communities	Classification by income group(Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
1	Achimota Forest Residential	NA	1A	I	NS: does not boarder river
2	Roman Ridge	1st classs	1A	O	NS
3	Airport Residential	1st classs	1A	I	NS:does not boarder river
4	East Legon	1st classs	1A	I	NS:does not boarder river
5	Ambassadorial Enclave	NA	1A	O	NS
6	Ridge	1st classs	1A	O	NS
7	La Hotels Area	NA	1A	O	NS
8	Switch back Rangoon	NA	1A	O	NS
9	Cantonments	1st classs	1A	O	NS
10	Zoti	1st classs	1B	O	NS
11	Abelemkpe	1st /2nd class	1B	I	S: boards river and reflects different conditions from Nima 3rd and 4th class
12	Dzorwulu	1st classs	1B	I	S:boards river and conditions different from 3rd and 4th, host urban farmers
13	North Dzorwulu	1st classs	1B	I	S: does not boards river
14	Nungua Newtown	NA	1B	O	
15	East Legon Extension	NA	1B	NA	
16	West Legon	NA	1B	I	NS: boards river but similar conditions as Dzorwulu
17	Ringway Estates	1st classs	1B	O	
18	Nyaniba Ako Adjei Area	NA	1B	O	
19	Labone Estates	NA	1B	O	
20	Golf Hill	NA	1B	O	
21	North Labone/Estates	1st classs	1B	O	
22	Airport Hills	NA	1B	NA	
23	Martey Tsuru	NA	1B	NA	
24	Manet Estate/Regimmanuel	NA	1B	O	

Number	Communities	Classification by income group(Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
25	Tesano 1	NA	1B	I	NS:does not boarder river
26	Kokomlemle	2nd class	2A	I	S:household wastewater lead to river
27	South Odorkor	2nd class	2A	O	
28	Dansoman Estates	1st/2nd class	2A	O	
29	Latebiokorshie	2nd class	2A	O	
30	Candle Factory	NA	2A	O	
31	Mamprobi	3rd	2A	O	
32	Kanda Estates	NA	2A	I	
34	Akuffo Addo	NA	2A	I	NS:does not boarder river
35	Asylum Down	1st classs	2A	I	NS:does not boarder river
36	Naafajo	NA	2A	NA	
37	Okpoi Gonno	NA	2A	NA	
38	Greda Estates	NA	2A	O	
39	Teshie Nungua Estates	1st classs	2A	O	
40	Beach Front	NA	2A	O	
41	Regimanuel Grey	NA	2A	O	
42	Baatsona	NA	2A	O	
43	New Achimota	NA	2A	O	
44	Kwashiemman north	NA	2B	O	
45	Sakaman-Busia	2nd class	2B	O	
46	New Dansoman	NA	2B	O	
47	Mateheko	2nd class	2B	O	
48	Osofo-Dadze	NA	2B	O	
49	West Abossey Okai	NA	2B	I	NS:does not boarder river
50	Dansoman Exhibition	NA	2B	O	
51	Dansoman Sahara	NA	2B	O	
52	Adabraka	NA	2B	I	does not boarder river
53	South La Estate	NA	2B	O	
54	Palm Wine Area	NA	2B	O	
55	Tesano 2	NA	2B	NA	
56	Tebibilano	NA	2B	NA	
57	Tsuibleoo	NA	2B	O	
58	Agblesaa	NA	2B		
59	Nautical	NA	2B	O	
60	Teshie Fertilizer	NA	2B	O	
61	Gonyitey/Nungua Barrier	NA	2B	O	

Number	Communities	Classification by income group(Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
62	Ravico	NA	2B	O	
63	Buade/5000	NA	2B	O	
64	Nungua	2nd class	2B	O	
65	Kaneshie	2nd class	2B	O	
66	Abeka	NA	2B	O	
67	Fadama	NA	2B	O	
68	Apenkwa	2nd class	2B	O	
69	North Kaneshie Estates-CFC	2nd class	2B	O	
70	Akweteman	2nd class	2B	O	
71	Kanda Estates	1st class	NA	I	NS:does not boarder river
72	Tesano	1st class	NA	I	NS:does not boarder river
73	Burma Camp	1st class	NA	O	
74	Kwashibu	NA	3A	NA	
75	Kwashieman	NA	3A	O	
76	North Odorkor	NA	3A	O	
77	Odorkor Old Town	NA	3A	O	
78	Kwashieman Old Town	NA	3A	O	
79	Odorkor	2nd class	3A	O	
80	Stanley Owusu	NA	3A	O	
81	Banana Inn	NA	3A	O	
82	Mamprobi Sempey	NA	3A	O	
83	Maamobi	NA	3A	I	NS:does not boarder river
84	Old Dansoman	2nd class	3A	O	
85	Kotobabi Police Station	NA	3A	I	NS:does not boarder river
86	Kpehe	NA	3A	I	boards river but similar conditions as and near Alajo
87	Alajo	2nd /3rd	3A	I	S:boards river and satisfies criteria
88	Kotobabi	NA	3A	I	NS:does not boarder river
89	James town	NA	3A	I	NS:does not boarder river
90	La/Labone	NA	3A	O	
91	Manhean	NA	3A	O	
92	Teshie Tafo	NA	3A	O	

Number	Communities	Classification by income group (Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
93	Abogbloshie	2nd class	3A	I	NS: borders river but largely commercial centre
94	Coco Beach/Cold Store	NA	3A	O	
95	Abeka Lapaz	NA	3A	O	
96	Bubuashie/Cable and Wireless	3rd class	3A	O	
97	New Fadama	3rd class	3A	O	
98	Kisseman/Christian Village		3A	I	NS: does not boarder river
99	W/Okponglo	2nd class	NA	I	NS: does not boarder river
100	Link Road	2nd class	NA	NA	
101	Osu	2nd class	NA	O	
102	South Labadi	2nd class	NA	O	
103	Akokorfoto	2nd class	NA	O	
104	Darkuman	2nd class	NA	O	
105	New Abossey Okai	2nd class	NA	NA	
106	Teshie Newtown	2nd class	NA	O	
107	Asylum Down	2nd class	NA	I	NS: does not boarder river
108	Sahara	2nd class	NA	O	
109	Chorkor	2nd class	NA	I	NS: does not boarder river
110	Sakaman	2nd class	NA	NA	
111	Labadi-aborm	2nd class	NA	O	
112	East Legon	2nd class	NA	I	NS: borders tributary of river, similar conditions as Dzorwulu
113	Odawna	2nd class	NA	I	NS: borders river but similar conditions as Alajo
114	Nii Boi Town	2nd class	NA	NA	
115	Achimota	2nd class	NA	I	NS: borders river but similar conditions as Kokomlemlle and too close to Abofu
116	Tesano	2nd class	NA	I	NS: does not boarder river
117	North labone	2nd class	NA	O	

Number	Communities	Classification by income group (Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
118	Mantseman	2nd class	NA	NA	
119	North Industrial Area (Avenor)	2nd /3rd class	NA	I	S: borders river and reflects different conditions from Alajo or Nima
120	Osu	2nd class	NA	O	
121	South Amanhoma	2nd class	NA	O	
122	Osu Ako-Adjei Estates	2nd class	NA	O	
123	Sempe New Town	2nd class	NA	O	
124	Kotobabi	2nd class	NA	I	
125	Odorkor	2nd class	NA	O	
126	Okaishie	2nd class	NA	O	
127	Abossey Okai	4th class	3B	I	NS: does not boarder river
128	Sukura	3rd class	3B	O	
129	Russia		3B	O	
130	Sabon Zongo	4th class	3B	I	S: channels enter river and lagoon system and reflects conditions different Alajo or Nima
131	Town Council Line		3B	NA	
132	Mamponse	3rd class	3B	NA	
133	Tunga		3B	NA	
134	Nima	3rd class	3B	I	S: borders river on a tributary
135	Accra New Town	2nd class	3B	I	does not boarder river
136	Shiashie Village	NA	3B	I	does not boarder river
137	Dakuman	NA	3B	O	
138	Bawleshie	NA	3B	O	
139	Mempeasem	NA	3B	O	
140	Teshie New Town	NA	3B	O	
141	Anumle Nungua Old Town	4th class	3B	O	
142	North Abeka	NA	3B	O	
143	Old Bubuashie	3rd class	3B	O	
144	Teshie Zongo	NA	3B	O	
145	Nii Boyeman /Achimota	NA	3B	O	

Number	Communities	Classification by income group (Local Gov. Bulletin, 2002)	Payment of property rates (Local Gov. Bulletin, 2008)	Location in relation to catchment [I=inside; O=Outside]	Selected (S); Not selected (NS)
146	Abofu	3rd	2B/3B	I	S:boards river at point river enters the city
147	Chorkor	NA	3C	I	NS:does not boarder river
148	Mpoase	NA	3C	NA	
149	Gbegbeise	3rd class	3C	NA	
150	Shiabu	NA	3C	NA	
151	Luga	NA	3C	NA	
152	Osu Amanfo/Alata	3rd class	3C	O	
153	La Inshorna Slum	NA	3C	O	
154	Zabramaline	3rd class	NA	O	
155	New Mamprobi	3rd class	NA	O	
156	Chemuna	3rd class	NA	O	
157	North Labone	3rd class	NA	O	
158	Korle Gonno	3rd class	3A	I	boards Lagoon, similar conditions as Sabon Zongo
159	South Shiashie	3rd class	NA	I	NS:does not boarder river
160	Dansoman Amanhoma	3rd class	NA	O	
161	Osu-Ako-Adjei	3rd class	NA	O	
162	Nugua-Zongo	3rd class	NA	O	
163	Kotobabi	3rd class	NA	I	NS:does not boarder river
164	Odorkor	3rd class	NA	O	
165	Darkuman	3rd class	NA	O	
166	Teshie Old Town	4th class	NA	O	
167	Asere	4th class	NA	O	
168	Bukom	4th class	NA	NA	
169	Chorkor	4th class	NA	O	
170	Ussher Town	4th class	NA	I	
171	Abokobi-Pantang	NA	NA	I	S: boards river and reflect peri-urban condition
172	Agbogba	NA	NA	I	boards river and refelct peri-urban conditions
173	Haatso	NA	NA	I	NS: boards river but was conducive for water samples

APPENDIX 3.2: GUIDANCE QUESTIONS FOR FOCUS GROUP DISCUSSION

Name of individuals (with permission only):

.....

Date and location of interview:/...../08

Interviewer:

Section A.

Water use for livelihoods

This section will inform on how communities obtain water, the different uses for the water, some of the problems they encounter in accessing water. Also how they think these problems can be resolved. It will also reveal what the people do for a living, the strategies they roll out to survive, and what they intend achieving from these strategies or the goals of these livelihood decisions. Semi-structured interview will be used in a Focus Group Discussion.

1. Access and use of water

1. How and where do you access water? What are the different uses of water currently? (domestic/reproductive and productive purposes)
2. How much do you pay to be connected to the water pipeline?
3. How much do you pay for water? (from own pipe, neighbour, public stand pipe, water vendor)
4. How regular is your water supply?
5. What do people do when water supply is irregular? (pipeline/public standpipe, water vendor etc)
6. What do you think of the water supply system in Accra? What do you think are the reasons for the current state? How can these problems be resolved?

2. Livelihoods

7. What are the main population groups in this area? (in terms of area of origin, length of residence, occupation etc)?
8. What are the most common activities people do for a living in the community? What are the less common activities people do for a living? E.g. the activities or occupations through which people make a living – employee, casual labour, self employed enterprises, fishing, trade etc.
9. What influences choice of activities? Is there any association with age, gender, education, particular social groups etc.? Are they based on access to assets – human (education, skills, health care) physical (housing, transport, equipment) natural (land, water), financial (income and savings and credit).
10. Over the past ten years have some people become better off? What has helped them escape from poverty? (livelihood strategies)

3. Social networks

11. Are there any associations in this community?
12. How have these associations evolved? What do these associations engage in?
13. How does one become a member?

14. Are some individuals excluded from the association? What are the factors? How does membership of the association influence access to water and livelihoods?
15. What problems confront these associations and how are they resolved?

4. Perceptions of water quality

16. How do people understand water quality? And how important is it to the community?
17. What do you think about the water quality of surface water in the community and also in Accra?
18. What are some of the environmental problems you see in this community? Why is the situation so?
19. Does the community see any link with environmental management and water quality?
20. What can be done to change this situation if there is any?
21. Who/what is perceived to be affecting water quality in the catchment and why? How should this be addressed?
22. What effort is made to protect or conserve water at the catchment or city level?
23. Does the community pay for environmental management?

5. Changing water polluting behaviours

24. Is the community involved in water polluting behaviours?
25. If water quality problems are linked to the members of the community, how will a call on behaviour change be received?
26. What causes people to change their behaviour? Please give some examples
27. How has behaviour been changed in the past?

6. Institutional commitment

28. Which institutions are known to be responsible for different water services? What is your opinion on their activities?
29. What happens when there is a break down in water services delivery?
30. Does this exclude some community members from accessing water?
31. How does this affect water use for livelihoods?
32. Is this community in anyway involved in the decision making processes on water for livelihoods?
33. If no, why? Should this be changed and how can this happen? What are your expectations if it is to be changed?
34. What are the existing decision-making processes, civic bodies, social rules and norms, etc within the community?
35. How are the people who take decisions which directly affect water and livelihoods in the community and city constituted? How are they changed?
36. Are you involved in any conflict on use and access of water?

Section B

Who is a poor person and what do people in the community do when experiencing hardships in making a living

This section will establish local definitions and understanding of poverty. More importantly what people do when encountering hardships in making a living. Why those decisions are made and how they have been able to escape from poverty through

such decisions in the past. Use **semi-structured interview in a Focus Group Discussion**.

Understanding poverty and its dimension

1. What is a good living and what is a bad living?
2. How do you understand poverty/wealth to mean (The facilitator should explore the dimensions of poverty, not just the lack of money)?
3. What are the characteristics of a poor/wealthy man and woman?
4. What proportion of the community would you estimate is in each category?
5. Have some people become poorer? What makes people poor or vulnerable? What are their ways of coping? (include environmental, social, economic and policy/regulatory issues e.g. relating to water for livelihoods)

Section C

Sanitation and waste management

Semi-structured interview in a Focus Group Discussion

1. What is the sanitation situation in this community? What proportion of households has toilets inside the home? What kind? (pit latrines, flush toilets + septic tanks, etc). How many households use shared toilets?
2. Are there individuals without any access to sanitation? And what do these do?
3. Do individuals have access to waste disposal?
4. What are the charges and payment system for sanitation services?
5. What happens to the area around your house when it rains? (e.g. flooded, well drained?).
6. Have there been any initiatives under taken by the community to improve sanitation conditions? (What, where, by whom, etc.). How were resources mobilized? What group(s) bore the cost and what groups benefited from the initiative?
7. What interaction have you had with bodies responsible for sanitation and waste management (Waste Management Department, AMA, etc)? How frequently do they visit?
8. Have you ever heard of a campaign on the protection of water sources? By whom? And when?

Expected participants: Two young men, two young women, three elderly/old men, three elderly/old women

Justification:

The young men and women to provide insight into current experiences

The old men to provide insight into both current and past experiences

The inclusion of men and women is to enable information on the different roles to be procured.

APPENDIX 3.3: GUIDE QUESTIONS FOR ORGANISATIONAL INTERVIEW

1 Strategic programme planning and programme implementation

- How are policies, goals, vision, and mission formulated? What are the review schedules?
- Are there any participation and public consultation processes in programme design and planning?
- Is information collected on stakeholder needs, risk assessment, targeting and beneficiaries?
- In programme implementation, what are the existing consultative and decision making processes, leadership, assignment of responsibilities, team work, and feedback loops which exist?
- Are there typical cases of learning from experiences?
- [Is there a special planning for water courses? Pipelines? Hydrants? etc]

2 Quality assurance

- What are the existing M&E systems, reporting, evaluations and assessment procedures?.

3 External relationships

- Does the organisation seek to create and manage collaboration and partnerships with other organisations and stakeholders?.
- Are you engage in any multistakeholder dialogue?
- Does the organisation seek to ensure the representation and participation of marginalized and excluded peoples and of women?

4 Human resource management

- How is staff recruitment done? , how are they motivated to retention them?
- Is the promotion path obvious?
- Is there a mentoring system in place?
- Is there a professional development plan for staff?
- Is there equal opportunity (gender and diversity) for staff?
- Is there a performance appraisal for staff?
- What will you say about staff dedication? Does staff have appropriate skills [staff skills diagram?]

5 Financial management

- How is budget planning and management carried out?
- What financial control systems are in place?
- What will say about financial transparency?
- What are your sources of funding?
- Is the organisation allowed to actively seek for funding to execute its mandate?

6 Communication and Information management

- What are the existing communication channels in the organisation? And how effective are these in terms of content and channels- for both internal and external- on the organization (in relations to objectives, plans, policies, procedures and performance)?
- How information is managed and how accessible is it in the organisation?
- Is there a system for internal dialogue?
- Is there organisational awareness and responsiveness to key gender and diversity issues?

➤ How is organisational change managed?

7 Does the organisation seek constructive feedback and suggestions for improvement?

8 Are there existing complaints procedures and codes of conduct?

APPENDIX 3.4: ORGANISATIONS IN THE WATER AND ENVIRONMENT SECTORS

Category in terms of function	Organization	Sector Ministry	Key role
Regulatory Agencies	Water Resources Commission [WRC]	Ministry of Water, Works, and Housing	Government body responsible for protection of water resources
	Public Utilities Regulatory Commission [PURC]	Ministry of Water Resources Works and Housing	Regulation of utility rates
	Environmental Protection Agency [EPA]	Ministry of Environment Science and Technology	Protection of the environment from pollution
	Lands Commission	Ministry of Lands and Natural Resources	Protection of lands and to stream line land transactions
Other government bodies for water and environment	Accra Metropolitan** Assembly Planning and Co-ordinating Unit[AMA-PCU]	Ministry of Local Government and Rural Development	Coordinate the Metropolitan plans and implementation
	Accra Metropolitan Assembly Town and Country Planning Department [AMA-TCPD]	Ministry of Local Government and Rural Development	Spatial planning and issuance of permits for construction activities
	AMA-Waste Management Department [WMD]	Ministry of Local Government and Rural Development	Solid and Liquid waste management
	AMA-Public Health Department [PHD]	Ministry of Local Government and Rural Development	Promote and safe guard public health
	Ga East District Assembly	Ministry of Local Government and Rural Development	Management of the District
	AMA-Food and Agriculture Department	Ministry of Local Government and Rural Development/ Ministry of Food and Agriculture	Coordinate all agricultural activities in the Metropolis
	Water Directorate	Ministry of Water Resources Works and Housing	Coordinate Government policies and programmes on water
	Hydrological Services Department	Ministry of Water Resources Works and Housing	Design of hydrological structures
	Irrigation Development Authority	Ministry of Food and Agriculture	In charge of all irrigation development
Research	International Water Management Institute IWMI [NGO]	-	Water, environment and food
	Council for Scientific and Industrial Research – Science technology Policy Research Institute [CSIR-STEPRI]	Ministry of Water Resources Works and Housing	Science Technology Policy research Institute
	CSIR-Water Research Institute [CSIR-WRI]	Ministry of Environment Science and Technology	Water research
NGOs	Coalition of NGOs in the Water Sector [CONIWAS]	-	Advocacy
	Action AID	-	Food and Agriculture development
	Water AID	-	Water development

	Organisation	Sector Ministry	Key role
	EnterpriseWorks	-	Agriculture technology
	ProNet-Water, Sanitation, Hygiene-	-	Water, sanitation and environmental issues
Donors	DANIDA	-	Provide funding for projects
	FAO	-	Provide funding for projects
	EU	-	Provide funding for projects
	World Bank	-	Provide funding for projects
	DFID	-	Provide funding for projects
	UNDP	-	Provide funding for projects
	UNICEF	-	Provide funding for projects
	UN-Habitat	-	Provide funding for projects
	SNV/RE	-	Provide funding for projects
	AfDB	-	Provide funding for projects
	GTZ/KfW	-	Provide funding for projects

Departments under the Accra Metropolitan Assembly [AMA]**

1. Office of the Accra Metropolitan Assembly Chief Executive -Metropolitan Development Planning Unit
2. AMA-Treasury Department
3. AMA-Education Department
4. AMA-Town and Country Planning Department
5. Accra Metropolitan Assembly [AMA] Public Health Department
6. AMA-Waste Management Department
7. AMA-Department of Food and Agriculture
8. AMA-Works Department
9. AMA-Security Department
10. AMA-Road Department
11. AMA-Department of Rural Housing

APPENDIX 3.5: HOUSEHOLD SURVEY QUESTIONNAIRE

Improving urban water quality for livelihoods enhancement in the Odaw-Korle River Catchment of Accra, Ghana

This questionnaire is a follow-up to the Focus Group Discussions [FGDs] which were carried out in some selected communities in Accra. It is to help to quantify and measure some of the information obtained and obtain additional information for establishing necessary relationships. Respondent confidentiality is assured.

Interviewer:

Date and location of interview:

Name of respondent (Optional):

SECTION A: The Household

1. Respondent is head of household?: Yes [1] No [2]
2. Gender: ... Man [1] Woman [2]
3. Religion: Christianity [1] Islam [2] Traditional [3] Other____
4. Native language: Akan [1] Ga/Ga-Adangbe [2] Ewe[3] Northerner [4] Other [5]
5. Marital status : Married [1] Single [2] Widow/widower [3] Divorced [4] Separated [5]
6. Details of household members

Household member and relationship to head of household (or to spouse of household head) e.g. <i>Household head, spouse of head, child, parent, grandparent, grandchild, sibling, in-law, nephew, niece, adopted/fostered child.</i>	Gender	Age (years)	Highest level of Education achieved <i>Primary [1] ®Intermediary [2] *JHS [3] *SHS [4] Vocational [5] Tertiary [6] Other</i>	In school Y/N
1 Household head	M / F			
2	M / F			
3	M / F			
4	M / F			
5	M / F			
6	M / F			
7	M / F			
8	M / F			
9	M / F			
10	M / F			

*JHS-Junior High School; SHS-Senior High School/Secondary School; @Middle Sch. L. Certificate

7. How many years have you been in Accra

8. Place of origin:_____

9. Main occupation_____

10. Where is this occupation carried out? In and around the house [1] outside the house but in the community [2] Outside the community [3]

11. Occupation (s) /sources of income of household members__[use the Table below]___

Number	Main occupation-details and location	Average income/month	Other occupations	Average income/month
1				
2				
3				
4				
5				
6				
7				

SECTION B: Contextual Information on Poverty

12. What is the importance of the following indicators in relation to your understanding of poverty? Using the below indicators, please rank as 1: 1st importance; 2: 2nd importance: 3: 3rd importance

No.	Indicator	Importance		
		1 st	2 nd	3 rd
	Social and personal well-being:			
1	Family background : Poor family background			
2	Social obligation: inability to pay children's school fees or take care of children and wife			
3	Appearance: Dirty in physical appearance, wearing of poor clothing			
5	Begging: receiving alms from others			
6	Social vices: involvement in prostitution and drug use			
	Psychological/mental state:			
7	Mental state: worries, thinking about what to eat, fear that children may insult him/her, lack of peace			
8	Social security: Lack of investments for tomorrow			

No	Indicator	1 st	2 nd	3 rd
	Access to water and sanitation			
9	Low level of access			
10	Inability to afford cost			
	Health and personal hygiene status			
11	Poor health status			
12	Personal hygiene: physical cleanliness-occurrence of offensive body odour			
	Access to food			
13	Inability to afford three square meals per day			
	Access to jobs and income			
14	Lack of job or livelihood			
15	Self insufficiency: economic dependence			
	Financial status			
16	Lack of money, low purchasing power, lack of financial, investments, borrowing with difficulty or inability to pay back			
	Material possession			
17	No ownership of land, houses [shelter/accommodation], cars, nor shop			

13. What is the importance of the following indicators in relation to factors which trap people in poverty in this community? Please rank each indicator as: 1:1st importance; 2:2nd importance; 3: 3rd importance

No	Indicator	Importance		
		1 st	2 nd	3 rd
1	Laziness or looking down on some jobs			
2	Social vices: drunkenness, carelessness, stealing, prostitution			
3	Job situation: low salary, lack of job, lack of capital to start own job			
4	Parental challenges: death of parents, irresponsibility of parents and guardians, poor parents, broken homes, single parenthood, lack of parental control, poor family background			
5	Low educational background			
6	Lack of planning of family			
7	Ill health or living in unsanitary environment			

14. What is the importance of the following indicators in relation to how people cope with poverty in this community? Please rank each indicator as: 1-1st importance; 2-2nd importance; 3-3rd importance

No	Indicator	Importance		
		1 st	2 nd	3 rd
1	Seek support [such as engage in borrowing or begging]			
2	Engage in social vices: stealing, prostitution			
3	Reduce the frequency and the quality of food			
4	Depending on friends			
5	Depending on families			
6	Depending on remittances from abroad			

SECTION C: Assets

Human

15. Do you have health insurance for all members of your household? Yes [1]
No [2]
16. Does any member of your household suffer from a disability? Yes [1] No [2]
17. Does any member of your family suffer from a chronic disease? Yes [1]
No [2]

Physical

18. Does the household/ any member of your household own the following?

Physical Assets	No.	Watch/clock	No.
House		Sewing machine	
Flush toilet		Electric iron	
Mains electricity		Refrigerator	
Car		Television	
Bicycle		Radio/tape recorder	
Motor bike		Radio	
Generator		Video deck	
Water Pump		DVD player	
Sprayer		Mobile phone	
Gas stove		Other toilet	
Electric stove		Bathroom	
		Others (specify)	

19. What is the nature of the house? Single room detached [1] Double room self contained detached [2] Single room compound house [3] Double room self contained compound house [4] three or more rooms semi-detached [5] Others, specify _____ [6]

Financial

20. Do you or any member of your household have a bank account? Yes [1] No [2]
21. Are you or any member of your household a member of savings group? Yes [1]
No [2]
22. Have you or any member of your household accessed a loan or credit facility recently? Yes [1] No [2]
23. Do you or any of your household members have other sources of income apart from occupational sources? Yes [1] No [2]

Natural

24. Does the household own a garden? Yes [1] No [2]
25. Does household or any member of the household own a farm outside Accra? Yes []
No []

26. Does the house own any livestock in or outside the community? Yes [1] No [2]

27. How many individuals of livestock if yes? _____

Social

28. Do you or any household member play a role in community leadership? Yes [1]
No [2]

29. Do you or any member of your household play a role in political leadership Yes [1]
No [2]

30. Do you or any member of your household play a role in religious leadership? Yes [1]
No [2]

31. Do you or any member of the household belong to any occupational society or association? Yes [1] No [2]

32. Do you or any member of your household belong to other societies or associations? Yes [1] No [2]

33. Is there trust among community members? Yes [1] No [2]

SECTION D

Water for Livelihoods

Access to water

28. Do you have your own tap water connection? Yes [1] No [2]

29. If no, how do you access water? Fetch from neighbours connection [1] Buy from small-scale water vendors [2] Buy water retailed from polytank [3] Buy from water tankers [4] Other _____ [5]

30. If water is fetched from outside the home, how long does it take for a round trip? 0-15 mins [1] 15-30 mins [2] 30-45 mins [3] 45-60 mins [4] >60 mins [4]

31. By what means do you convey the water?
On foot [] Car [] Donkey [] Hand driven cart [] Others _____ [5]

32. Who fetches water? Mother [1] Father [2] Children [3] House help [4] Other _____

33. Who pays for water in the household? Father [1] Mother [2] Children [3] Other _____ [4]

34. How do you store water? In buckets [1] gallons [2] drums [3] overhead tanks [4] other _____ [5]

35. Have you had cause to complain about the cost of water? [Either the bill or price paid to buy water from a vendor] Yes [1] No [2] Explain
Explain _____

36. Does cost of water from alternative sources increase when the taps are not flowing? Yes [1] No [2]

37. How regular is the tap water flow? Flows for most part of each month [1]
 three weeks in a month [2] two weeks in a month [3] one week in a month [4]
 less than a week in a month [5]
38. On the day it flows, which periods of the day does water usually flow? 06:00 am-
 12:00 noon [1]
39. 12:00 noon -06:00pm [2] 06:00 pm -00:00 midnight [3] 00:00 midnight -06:00
 am [4] 24hours [5] Others_____
40. Are there any problems with the quality of the tap water? Yes [] No []
41. If yes, what are these problems? presence of impurities in water [1] water is saline
 [2] presence of small worm-like organisms in water [3] Presence of algae [4]
 other_____ [5]
42. How much do you spend on water daily? Or what quantity of water is used
 including water for productive activity? [Indicate size of bucket, gallon or any other
 containers that is used and then calculate volume of water]
 a. Domestic purpose: _____
 b. Productive purpose: _____

Estimation of income on productive business

Business 1(describe activities and products and whether seasonal
 or year round?)

43. What is the total cost of inputs of business?

Input	Cost [per time frame]
Water	see above
Labour [per day/per week/]	
rent	
Electricity	
Transportation	
Total	

44. What is the unit price of your product?
45. On average how many people do you serve daily?
46. How many days in a week /month do you produce or render services?

47. What is the OUTPUT of your business? (Quantify services or products produced or services rendered in a specified time frame – day, week, month-to be computed at analysis stage etc) Analysis only

48. Under what conditions would you expand your business?

49. Would you expand your business if access to water improves? Yes [1] No [2]

Business 2 [use additional sheet and repeat questions 48-54]

Business 3 etc. [use additional sheet]

SECTION E: Perception of Odaw River [Water] Quality, Sanitation and Waste Management

54. I would like to ask your opinions on the quality of the water in the Odaw-Korle River system. How much do you agree or disagree with the following statements? [Perception of risks]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	<u>Uncontrolled disposal</u> of liquid and solid waste affect the quality of the river	1	2	3	4	5
2	<u>Open defecation</u> into the river affects the quality of the water	1	2	3	4	5
3	If <u>industries stop discharging effluent</u> into the river, the quality of the river would improve	1	2	3	4	5
4	The <u>quality of the river water in the city</u> can not improve so long as wastewater drains link to it	1	2	3	4	5
5	The <u>water quality</u> poses a risk to <u>children's health</u>	1	2	3	4	5

55. Next we will consider **solid waste collection practices**. How much do you agree or disagree with the following statements? [Responsibility]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	Solid waste collection should be at both the community and household level					
2	Informal solid waste collectors are part of uncontrolled disposal of solid waste into the environment					
3	Children sent to dispose of solid waste into containers are part of the problem of uncontrolled disposal into the environment					
4	Cost of solid waste disposal is expensive and is responsible for uncontrolled disposal					
5	Cost of solid waste disposal should be borne by the state to enhance access to disposal services					

56. This question focuses on the type of **access to toilet**. How much do you agree or disagree with the following statements? [Responsibility]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	Majority of people have access to toilets in their houses					
2	The community needs public toilet and I am willing to pay to access it					
3	The type of public toilet is important in pollution control					
4	I am aware that there is uncontrolled disposal of human excreta from pan latrines into the Odaw River					
5	Wrapping and disposing of individual human excreta into the river and its surroundings is common in this community.					

57. Next we discuss **community collective action and cohesion**. How much do you agree or disagree with these statements? [Attitudes]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	The <u>community would respond to measures</u> to change practices and behaviour which pollute the water					
2	Lack of <u>neighbourhood planning</u> contributes to behaviour that pollutes the river					
3	<u>Lack of common purpose or unity</u> in this community is also a factor in water pollution					
4	A <u>neighbourhood watch dog committee</u> can supervise people to change their behaviour towards the river					
5	If everyone plays a <u>'policing' role</u> , water pollution can be controlled					

58. Specific **behaviour** in relation to surface water. How much do you agree or disagree with these statements? [Attitude]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	People can be <u>persuaded</u> to <u>change</u> their behaviour					
2	Community champions [opinion leaders] can help change behaviour					
3	<u>Spiritual leaders</u> can help to <u>change</u> people's behaviour					
4	Increased <u>information and education</u> will help to <u>change</u> behaviour					
5	<u>Selfishness</u> will make it difficult for people to change their behaviour					

59. **People** who contribute in **polluting the river** and their **relationship** with **community members** [Subjective norm]. How much do you agree or disagree with these statements?

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	There are people who set good examples for others to follow on attitude to the environment					
2	There is no system in place to recognise community members who confront polluters					
3	Opinion leaders caution polluters about their behaviour and practices					
4	Water pollution issues should be discussed at social gatherings in the community					
5	Community members are only interested in acting in a way that will serve their interest on issues relating to the environment					

60. The role of the **city authority** in relation to the **quality of surface water**. How much do you agree or disagree with these statements? [Trust in authorities]

	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	There is regular engagement between communities and the responsible water organizations					
2	The AMA is concerned with the quality of the river water					
3	The Assembly man or woman represents community concerns on Odaw River water quality at the Assembly					
4	People are aware of where to report polluters in the community					
5	There is regular dredging of the river to control siltation					

61. Next we discuss the degree to which **laws and regulations** are **enforced** and the extent of **arrest and prosecution of polluters**. How much do you agree or disagree with the following statements? [Trust in authorities]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	Polluters in the community are arrested if seen					
2	It is difficult to arrest and prosecute polluters because acts are done in secret					
3	Arresting and prosecuting or imposing fines on polluters can help to reduce the water pollution					
4	It is difficult to revive the house-to-house- sanitation inspection by Public Health Authorities					
5	There is enforcement of regulations on environmental sanitation and solid waste management by city authorities					

62. Now we will consider the role of **Public education**. How much do you agree or disagree with the following statements [knowledge]

No	Likert items [attitude statements]	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
		1	2	3	4	5
1	It is necessary to improve on information delivery on surface water pollution to the community					
2	Education on water quality should be carried out by the AMA					
3	Awareness creation should start with schools and should involve the media					
4	A special community task force would be able to help in creating awareness on pollution control					
5	I am aware of campaigns on water pollution control					

63. What is the most important source of environmental information to you? Please rank each source as: 1-1st importance; 2-2nd importance; 3—3rd importance

	Indicator	Importance		
		1 st	2 nd	3 rd
1	Television			
2	Radio			
3	Drama			
4	Movie			
5	Newspaper			
6	Church			
7	Mosque			
8	Information van			
9	Community gatherings/durbar			
10	Posters			
11	Other			

APPENDIX 3.6: AGE, EDUCATIONAL STATUS, RELIGION AND MARITAL STATUS OF RESPONDENTS

Age of respondents

Community	Age range of respondents (%)								
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	
Abokobi-Pantang		10(4)	35(14)	25(10)	20(8)	5(2)	5(2)		100(40)
Agbogba	4.8(2)	19(8)	40.5(17)	19(8)	11.9(5)	4.8(2)			100(42)
Abelemkpe		30.8(12)	15.4(6)	30.8(12)	12.8(5)	10.3(4)			100(39)
Dzorwulu		12.5(5)	17.5(7)	27.5(11)	35(14)	7.5(3)			100(40)
Kokomlemle	9.3(4)	16.3(7)	32.6(14)	20.9(9)	11.6(5)	4.7(2)	4.7(2)		100(43)
Nima	4.3(3)	8.7(6)	21.7(15)	43.5(30)	15.9(11)	4.3(3)		1(1.4)	100(69)
Alajo	7.1(3)	19(8)	31(13)	14.3(6)	9.5(4)	9.5(4)	4.8(2)	4.8(2)	100(42)
Abofu	6.8(3)	20.5(9)	18.2(8)	18.2(8)	20.5(9)	11.4(5)	2.3(1)	2.3(1.0)	100(44)
North Industrial Area [Avenor]	5(2)	25(10)	35(14)	22.5(9)	5(2)	5(2)	2.5(1)		100(40)
Sabon Zongo	4.7(2)	20.9(9)	32.6(14)	14(6)	18.6 (8)	7(3)	2.3(1)		100(43)
									440

Educational status of respondents of household interviews

Community	Level of education of respondent							
	Primary	Intermediary	JHS	SHS/SS	Vocational	Tertiary	Other	Total
Abokobi-Pantang	12.5(5)	40(16)	22.5(9)	17.5(7)	2.5(1)	5(2)		100(40)
Agbogba	7.1(3)	23.8(10)	9.5(4)	21.4(9)	9.5(4)	21.4(9)	7.1(3)	100(42)
Abelemkpe	2.6(1)	25.6(10)	15.4(6)	17.9(7)	17.9(7)	17.9(7)	2.6(1)	100(39)
Dzorwulu	-	31.6(12)	21.1(8)	31.6(12)	5.3(2)	10.5(4)		100(38)
Kokomlemle	23.3(10)	18.6(8)	16.3(7)	18.6(8)	2.3(1)	9.3(4)	11.6(5)	100(43)
Nima	27.9(19)	16.2(11)	8.8(6)	10.3(7)	1.5(1)	13.2(9)	22.1(15)	100(68)
Alajo	2.4(1)	38.1(16)	31(13)	7.1(3)	7.1(3)	2.4(1)	11.9(5)	100(42)
Abofu	7(3)	37.2(16)	7(3)	20.9(9)	7(3)	9.3(4)	11.6(5)	100(43)
North Industrial Area [Avenor]	7.7(3)	35.9(14)	30.8(12)	15.4(6)		2.6(1)	7.7(3)	100(39)
Sabon Zongo	11.9(5)	21.4(9)	14.3(6)	7.1(3)	2.4(1)	4.8(2)	38.1(16)	100(42)

Religion and marital status of respondent

Community	Religion				Marital Status				
	Christian	Muslim	Traditional	Other	Married	Single	Divorced	Widowed	Separated
Abokobi-Pantang	97.5(39)		2.5(1)		77.5(31)	15(6)	2.5(1)	5(2)	
Agbogba	88.1(37)	9.5(4)	2.4(1)		78.6(33)	19(8)			2.4(1)
Abelemkpe	97.4(38)	2.6(1)			61.5(24)	30.8(12)		7.7(3)	
Dzorwulu	95(38)	5(2)			79.5(31)	10.3(4)	2.6(1)	7.7(3)	
Kokomle	86(38)	11.6(5)		2.3(1)	47.6(20)	40.5(17)	7.1(3)	4.8(2)	
Nima	35.7(25)	64.3(45)			79.4(54)	16.2(11)	4.4(3)		
Alajo	85.4(35)	14.6(6)			61.9(26)	31(13)		4.8(2)	2.4(1)
Abofu	72.1(31)	27.9(12)			45.2(19)	35.7(15)	4.8(2)	11.9(5)	2.4(1)
North Industrial Area [Avenor]	92.5(37)	7.5(3)			55(22)	35(14)	2.5(1)	5(2)	2.5(1)
Sabon Zongo	39.5(17)	60.5(26)			64.3(27)	28.6(12)	2.4(1)	4.8(2)	

APPENDIX 3.7: ANALYSIS OF FOCUS GROUP DISCUSSION NOTES IN THREE OF TEN COMMUNITIES

ABOKOBI-PANTANG

Access to water:

ID	Key point	Code
1Pc1	<i>“The Population was increasing in Pantang and there was only one source of water-</i>	rising population, pressure on water resource
1Pc2	<i>So they [Pantang people] created a second “dugout” and called it “Buhe” [new dugout]”</i>	surface water development
1Pc3	<i>“There is pipe born water, when the tap is not flowing then we resort to the dugouts</i>	Alternative source of water, access to treated water, supplementary use of surface water
1Pc4	<i>The flow is quite regular</i>	Regular supply of tap water
1Pc5	<i>“Most houses in Pantang lack water</i>	Limited connectivity
1Pc6	<i>There are three public stand pipes in the community where water is sold at a cost of 5 Ghana peswas/ size 28 bucket</i>	Limited public standpipes
1Pc7	<i>“The cost of connection to the pipe line depends on the extension</i>	variable cost of connectivity
1Pm1	<i>We have access to water</i>	Access to treated water
1Pm2	<i>At Pantang we have ponds because we dug them</i>	Surface water development
1Pm3	<i>There are not individual pipes in Pantang-What pertains is community pipe. Majority of Abokobi people are not connected</i>	Limited connectivity
1Pw1	<i>“We have pipe connection and the source is ground water from Sesem--1</i>	Access to treated water
1Pw2	<i>There is rainwater harvesting into polytank</i>	Rainwater harvesting
1Pw3	<i>“From the earlier stages water sources for Pantang were rain water collected into barrels and ponds</i>	Historical use of rainwater
1Pw4	<i>“The Dakobi [river] is for washing, in the past it was for drinking, even right now some people drink it</i>	Changing use of river, current uses, past uses
1Pw5	<i>Tap water is regular</i>	Regular supply of tap water
1Py1	<i>Sources of water in Abokobi/Pantang include tap water</i>	Access to treated water
1Py2	<i>ponds were used for bathing, washing and other activities</i>	Historic use of surface water
1Py3	<i>At Pantang, when the taps are not flowing we use the ponds for washing and bathing-</i>	Current uses of pond

Concepts

statement	code
Increasing demand for water	1Pc1
Surface water development for use	1Pc2, 1Pc3, 1Pm2
Regular supply of tap water	1Pc4, 1Pw5,
Access to treated water	1Pc3,1Pm1,1Py1
Limited and variable cost of connectivity to tap water pipelines	1Pc5, 1Pc6,1Pm3, 1Pc7
Rainwater harvesting as an alternative source of water	1Pc2, 1Pc3, 1Pm2
Changing use of surface water	1Pc2, 1Pc3, 1Pm2

Categories/ themes

Surface and other alternative sources of water
1Pc2, 1Pc3, 1Pm2; 1Pc2, 1Pc3, 1Pm2; 1Pc2, 1Pc3, 1Pm2
Access and use of tap water
1Pc1; 1Pc4, 1Pw5; 1Pc3,1Pm1,1Py1

Factors influencing occupations

ID	Key point	Code
1Pc1	<i>Somebody going to school says that I am perfect in this and that, so that is what I will do"</i>	Talent, skill, education
1Pc2	<i>To somebody the qualification allows him/her to do farming or take up after the parents</i>	Education, circumstantial farming, adoption of parents' job
1Pc3	<i>"To some due to lack of financial support"-</i>	Lack of financial support
1Pc4	<i>"When we send the produce to the market we have low purchase so we do not want our children to farm"</i>	Low profitability of parents' job, child job preferences
1Pc5	<i>"Disobedience to parents when one is about completing school may cause the parents to change their plans about you</i>	Disobedience to parents
1Pc6	<i>There is somebody who disobeyed the parents on farming--6 and the father collapsed</i>	Disobedience to parents, child job preference
1Pc7	<i>Many do not want to support parents to get funds to support them</i>	Lack of cooperation with parents
1Pm1	<i>In those days the development was yet to catch up and the only thing one could do is the farming</i>	Urbanization, loss of farmlands,
1Pm2	<i>Due to development, farm lands have been sold, so farmers have no lands to cultivate</i>	Lands sold
1Pm3	<i>This issue has come to the notice of the District Assembly and the District says that they have nothing to do with lands</i>	District authority aware of land sales, district unable to intervene
1Pm4	<i>Farming has been very useful and helped people to educate their children</i>	Farming profitable, source of income, contribute to household investment
1Pm5	<i>What is being used to compensate the farmers is the rearing of livestock, little support from some NGOs-5</i>	Alternative occupation, compensation, livestock keeping , support of NGOs

1Pm6	<i>The support usually goes to the wrong people-5.</i>	Inequitable support
1Pw1	<i>lack of capital to do a job</i>	Start-up capital
1Pw2	<i>the cultivation of pepper seasonal and the women are employed as labourers to harvest</i>	Local opportunities
1Py1	<i>Some of those in farming do so to save money for business or for learning one form of trade or the other--</i>	Coping strategy
1Py2	<i>but another person has no money so he/she may be asked to train as an artisan</i>	Lack financial capital
1Py3	<i>The illiterate mentality is still there. Some do not see the importance of education</i>	Illiteracy leading to lack of appreciation for education
1Py4	<i>Mostly it is financial burden</i>	Lack of financial capital
1Py5	<i>and majority have no jobs and so depend on farming activities</i>	Lack of jobs Coping strategy
1Py6	<i>“May be if we are a lot and our father does not do a good job, he could give some the opportunity to school and the others not. The rest may go to learn a trade</i>	Lack of financial capital
1Py7	<i>but my father has no money to help so am working to save money train as an artisan</i>	Lack of financial capital
1Py8	<i>Most of the parents are illiterates, so if you are a male you are likely to be supported by parents, but if you are female, a bit of the old mentality that girls will get married, still influence parents’ decision</i>	Illiteracy leading to lack of appreciation for girl education

Concepts

Statement	Code
Innate abilities	1Pc1
Educational and skill development	1Pc1, 1Pc2
People’s coping strategy	1Pc2, 1Pm5,1Py1,1Py5,1Pm6
Adoption of parents job/parental influence	1Pc2
Lack of financial support	1Pc3,1Pw1,1Py2, 1Py4, 1Py6,1Py7,1Pw1
Low profitability of parent’s job	1Pc4
Personal preference for job type	1Pc4,1Pc6
Lack of cooperation with parent or guardian	1Pc5,1Pc6,1Pc7,
Urbanization and loss of farmlands	1Pm1, 1Pm2,1Pm3
Farming as source of income	1Pm4, 1Pw2
Illiteracy and promotion of education	1Py3, 1Py8

Categories/themes

Innate abilities and personal choices 1Pc1; 1Pc4 ,1Pc6
Education and human development 1Pc1, 1Pc2; 1Py3, 1Py8
Financial support and coping strategy 1Pc3,1Pw1,1Py2, 1Py4, 1Py6,1Py7,1Pw1, 1Pc4;1Pc2, 1Pm5,1Py1,1Py5,1Pm6,
Urbanization and consequence on local economic development 1Pm1, 1Pm2,1Pm3, 1Pm4, 1Pw2
Parental support and influence 1Pc2, 1Pc5,1Pc6,1Pc7; 1Pc5,1Pc6,1Pc7;1Pc4

Social networks/capital

ID	Key point	code
1Pc1	<i>Farmers and Traders Association-very few people on both sides-initially it was only farmers and then the traders joined-2.5</i>	Occupational Associations
1Pc2	<i>50peswas /month contributions are accounted for annually--</i>	Membership dues
1Pc3	<i>when the money is given you and for every month the money stays with you; interest of 1 cedi/10 cedis is paid-34-32 women</i>	Membership benefits, women dominated
1Pm1	<i>There is Boiman Women's Association called Peace and Love Association which is into community development, champion development of Pantang Farmers Association with a membership of 11 men</i>	Gender determined occupational association
1Pm2	<i>There is also the Kraban-loan for petty trading. Members of this group pay GHS 1 /month as dues and they have a membership of 22 women</i>	Gender determined occupational Association
1Pm3	<i>They liaise with NGOs who give loans</i>	Negotiate financial support for association

Concepts

Statements	ID
Support driven occupational associations	1Pc1,1Pc2,1Pc3,1Pm1, 1Pm2, 1Pm3

Apart from the above the community lives at peace with one another and it can be said that social capital is high within this community

Perceptions, attitudes and behaviour to surface water

ID	Key point	code
1Pc1	<i>The Dakobi is usually for bathing, household activities</i>	Current uses
1Pc2	<i>I used to drink but now the population has increased and because drains and soak away from different parts flow into the environment, I do not drink</i>	Historical uses, environmental pollution, non potable use
1Pc3	<i>The control on the river is relaxed as compared to the dugouts of which there is regular fetching</i>	Relaxed control on use, dug outs controlled, regular use of dugouts
1Pc4	<i>there is no filth or items likely to cause sickness</i>	River free from waste, health consequence from use
1Pc5	<i>The river is not salty-can be used for bathing, washing</i>	Current uses
1Pc6	<i>The water is of good quality because there has not been any reported problem</i>	Good quality, health consequence from use, physical consequences from use, reported consequence from
1Pc7	<i>“When the tap stops that is the only source of water’</i>	Emergency water source

1Pc8	<i>The scent of the water changes in the dry season especially when livestock hovers around and in it</i>	Seasonal changes in quality, physical impressions, pollution from livestock, odour, livestock movement
1Pc9	<i>the pipes came, some people do not regard the water and then step into the water with sandals, some wash in it. In the past the sandals were removed before going to the water</i>	Potable water availability, lowered values on water, increasing practices of pollution, falling traditional conservation practices
1Pc10	<i>Free range”; there are water closets in the new sites which are actually in the minority</i>	Open defecation, limited access to toilets
1Pc11	<i>So we are concerned about the drainage into the river</i>	Environmental pollution
1Pc12	<i>Rubbish is dumped into the environment”-</i>	No access to solid waste bins, open disposal of solid waste,
1Pc13	<i>We wake up early –to dump the rubbish”. Refuse dumped secretly. “There is link with these practices and the pollution of the water”- -13. “The population....</i>	Secret disposal, awareness of environmental effects
1Pc14	<i>“The population has put pressure on the dugout, polluting it with different items entering”</i>	Population effects,
1Pc15	<i>Animals drink from the water</i>	livestock movements
1Pm1	<i>Drains from the community go to the water-1</i>	Environmental pollution
1Pm1	<i>If this is not addressed it will lead to problems for the community”</i>	Influence of urbanization, current practices, measures to address pollution
1Pm2	<i>In the past the water was drunk</i>	Historical use of water
1Pm3	<i>The problems we have are the activities of the livestock</i>	Conflict in use, unregulated livestock movement
1Pm4	<i>There is no problem with the river because it flows each time and it is clean</i>	Flow regime, physical impression
1Pm5	<i>We have no machine to test, when you drink it is not salty, it used to be a source of drinking water, but now there are alternatives</i>	Limited quality assessment capacity, historical uses, alternative sources
1Pm6	<i>There is a specific place for rubbish disposal at Pantang but people still dump anywhere because the population has increased</i>	Designated disposal site, disposal practices, influence of urbanization
1Pm7	<i>Most have no household toilet and there are no public toilets so there is free range-</i>	Lack of indoor and public toilets, open defecation
1Pw1	<i>People dump the solid waste at two places at the outskirts of the community</i>	Open disposal of waste
1Pw2	<i>I see the problem as the fault of the Elders</i>	Relaxed local governance
1Pw3	<i>there was a system to make sure that the community is clean but these systems are broken down, there is lack of initiative at Pantang-</i>	Relaxed communal labour
1Pw4	<i>There is free range currently</i>	Open defecation
1Pw5	<i>It is clean, so I like it</i>	Physical impression
1Pw6	<i>Yes, there is a link with activities and pollution</i>	Environmental awareness

	<i>but we drink because we are used to it-</i>	
1Pw7	<i>I was born there, so the best thing to do is to make sure that there is proper sanitation</i>	Environmental awareness
1Pw8	<i>There is no risk to children</i>	Perceived health consequence from use, good quality
1Py1	<i>As it was used in the past, I am following tradition</i>	Historical uses, water embodiment of traditions
1Py2	<i>presence of organic waste, smell</i>	Quality
1Py3	<i>At Pantang, majority go to the bush to access open defecation</i>	Open defecation
1Py4	<i>I have a place in house where I burn the rubbish</i>	Household management of solid waste
1py5	<i>people pour on other people's land</i>	Improper disposal of solid waste

Concepts

Statements	ID
Perception of water quality based on historical change in uses	1Pc2, 1Pm2,1Pm5
Perception of water quality based on current and prospective uses	1Pc1,1Pc5,1Pc7
Open and hidden behaviour, practices and patterns of solid and human waste disposal leading pollution	1Pc2, 1Pc11, 1Pm1,1Pw6,1Pw7, 1Pc10,1Pc12,1Pc15,1Pm6,1Pm7, 1Pw1, 1Pw4,1Py5,1Py3,1Py4,1Py5,1Pc13
Relaxed control on surface water due to alternative sources of water	1Pc3, 1Pw2, , 1Pc9,1Pc7, 1Pm5
Perceived health consequence	1Pc5, 1Pc6,1Pw8
Perception based on Physical impression	1Pc6,1Pc8,1Pw5,1Pm4,1Py2
Urbanization has an impact on water and environmental resources	1Pc14,1Pm1,1Pm6,
Community participation in water and environmental pollution control	1Pw3
Demonstrating environmental awareness	1Pw6
Limited in-house toilets promoting open defecation	1Pm7

Categories/themes

use of surface water
1Pc1, 1Pc5, 1Pc7; 1Pc2,1Pm2,1Pm5
Perception and practices leading to pollution
1Pc2, 1Pc11, 1Pm1,1Pw6,1Pw7, 1Pc10,1Pc12,1Pc15,1Pm6,1Pm7, 1Pw1, 1Pw4,1Py5,1Py3,1Py4,1Py5
Community governance
1Pc3, 1Pw2, 1Pc9,1Pc7, 1Pm5; 1Pw3
Construction of surface water quality
1Pc6,1Pc8,1Pw5,1Pm4,1Py2; 1Pc5, 1Pc6,1Pw8
Urbanisation and environmental quality change
1Pc14,1Pm1,1Pm6; 1Pw6,

Influencing perceptions, attitudes, behaviour

ID	Key point	Code
1Pc1	<i>“To address these challenges we have spoken with the livestock owners-discussed at Abokobi farmers association</i>	Conflict resolution, conflicting interest on use, dialogue on use, livestock owners
1Pc2	<i>There was a sign post on the river banks but it was brought down</i>	Misunderstanding on conflict resolution, lack of consultation, advertisement as conflict resolution mechanism
1Pc3	<i>Sometimes around Abokobi people are even beaten for confronting offenders”</i>	Confrontation as conflict resolution mechanism, conflicting interest, approach to conflict resolution, livestock owners defiant, complainants threatened or beaten up
1Pc4	<i>The police are seen as partial so people who suffered threats failed to report to the police station</i>	Non-involvement of police, lack of confidence in police
1Pc5	<i>There is a chieftaincy dispute</i>	Chieftaincy dispute
1Pc6	<i>There used to be communal labour in the past but not today</i>	Relaxed communal labour
1Pc7	<i>People have taken the law into their hands</i>	Relaxed local governance
1Pc8	<i>We will need container for rubbish disposal and both public and household toilets</i>	Provision of facilities
1Pc9	<i>Livestock keepers should be spoken to by the city authorities to restrain them from roaming about with livestock</i>	Livestock owners, dialogue with livestock owners, District council involvement, approach to conflict resolution, control activities of livestock owners, control resource use, peaceful co-existence of use
1Pc10	<i>People will listen to the messages on changing behaviour-we will collaborate with such people</i>	Community is cooperative, community will buy into behaviour programmes, introduce behaviour change programmes, collaboration
1Pc11	<i>Existence of a chief would have facilitated observance of rules</i>	Resolve chieftaincy dispute, role of chief, traditional conservation practices, local governance
1Pc12	<i>We should plant bamboos to fence the river to restrain the livestock-</i>	Control livestock movement, ecological resource control
1Pm1	<i>The influence of urbanization makes control difficult</i>	Influence of urbanization, difficulty with local governance
1Pm2	<i>Help individuals to build toilets in their houses and build public toilets as well</i>	Provision of toilets
1Pm3	<i>Cultivate trees around the pond. When the Forestry brings us seedlings, and set up some rules we will plant it</i>	Ecological protective measures, demand driven protective measures, cooperation with external bodies
1Pm4	<i>Community traditional rules are not as effective as in the past</i>	Relaxed traditional conservation, relaxed local governance
1Pm5	<i>The population has increased, you do not know who is who, and the supervision is difficult</i>	Influence of urbanization, difficulty with local governance

1Pm6	<i>The District Assembly is effective. If it is reported to the Assembly they will take action but individuals for fear of victimization do not report</i>	Confidence in district council, fear of victimization, lack of interest in reporting
1Pm7	<i>Many of the communities lack chiefs due to numerous chieftaincy disputes</i>	Chieftaincy disputes,
1Pw1	<i>Communal labour is important</i>	Relaxed communal labour
1Pw2	<i>generate the interest of the public to plant trees around the ponds</i>	Ecological protective measures,
1Pw3	<i>The community is ready to collaborate</i>	Cooperation with external bodies
1Pw4	<i>Fence the pond with some form of net-</i>	Protective measures
1Pw5	<i>In the dry season, there is the need to clean the ponds</i>	Regular dredging
1Pw6	<i>Monitoring team should work</i>	Community watchdog
1Pw7	<i>The women's group should take the task of conserving the water body since we are mostly in charge of fetching and using water for various activities</i>	Active role of women in conservation
1Pw8	<i>Inhabitants especially should take it up to set our own council and address some of these problems"</i>	Community watchdog
1Pw9	<i>Offenders do not listen to calls to stop-, some of them do listen</i>	Conflict of interest
1Pw10	<i>Nothings happens to offenders because of a chieftaincy dispute</i>	Chieftaincy dispute, relaxed local governance, polluters not summoned
1Py1	<i>There is the need to construct public toilet and position rubbish container so that once it is full it is taken away</i>	Provision of toilets
1Py2	<i>The district should pressure government for in-house bins for household collection</i>	City intervention, provision of facilities

Concepts

Statements	Codes
Resource use conflict resolution	1Pc1, 1Pc2, 1Pc3,1Pc9,1Pw9,1Pc4,1Pw9
Promoting community participation in water and environmental management	1Pc6,1Pc7, 1Pw1;1Pc10,1Pw3;1Pw6,Pw8
Strengthening local governance for water and environmental management	1Pc7,1Pm4,1Pm5,1Pw10;1Pc5,1Pm7,Pw10,1Pc11
Promoting efficient and user friendly solid waste collection	1Pc8, 1Py2
Active participation of city authority in the enforcement of laws on sanitation and environmental pollution control	1Pm2,
Ecological approach to resource conservation	1Pc12,1Pm3, 1Pw2
Managing the influence of urbanization on resource management in the peri-urban environment	1Pm5
Empowering women for resource conservation	1Pw7
Formal involvement in provision of toilets	1Pm2, 1Py1

Categories/themes

Improving Local governance 1Pc5,1Pm7,Pw10,1Pc11; 1Pc7,1Pm4,1Pm5,1Pw10; 1Pc1, 1Pc2, 1Pc3,1Pc9,1Pw9,1Pc4,1Pw9; 1Pc6,1Pc7, 1Pw1, 1Pc10,1Pw3,1Pw7,1Pw6,Pw8; 1Pw7; 1Pc12,1Pm3, 1Pw2
Access to sanitation and solid waste management 1Pc8, 1Pm2,1Py2; 1Pc8, 1Py2
Pro-active law enforcement 1Pm2,1Pc8, 1Py2
Urbanization and planning 1Pm5;1Pc12,1Pm3, 1Pw2

Perception of wealth

ID	Key	Code
1Pc1	<i>Persons understanding-; way of doing things</i>	Understanding, beneficial judgment, approach to activities
1Pc2	<i>cleanliness, neatness and how one carries himself/herself about</i>	Environmental cleanliness, personal hygiene
1Pc3	<i>Able to afford facilities, children in good schools, he/she does not complain--</i>	Financial position
1Pm1	<i>3 square meals</i>	Ability to afford meals
1Pm2	<i>able to join when we are going "somewhere</i>	recognition
1Pm3	<i>, have some livestock</i>	Animal resources
1Pm4	<i>; own house</i>	Possession of dwelling unit
1Pm5	<i>money for taking care of children such that you have no problems with thinking</i>	Financial resources, ability to afford cost elements of life
1Pm6	<i>possess land and are able to do what is on your heart</i>	Land resources
1Pm7	<i>Have children and are able to take care of them, law abiding</i>	Ability to cater for household
1Pm8	<i>helps the community</i>	Community spirit, supportive to community, selfless
1Pw1	<i>Takes care of children to school</i>	Ability to cater for household
1Pw2	<i>has managed/planned his/her life very well such that depends on no one</i>	Ability to cater for household/ independent
1Py1	<i>Good job</i>	Access to job
1Py2	<i>Able to provide for family</i>	Ability to cater for household
1Py3	<i>provide three square meals for family</i>	Ability to cater for household
1py4	<i>own house--</i>	Possession of dwelling unit
1Py5	<i>no financial problems</i>	Sound financial capital
1Py6	<i>has basic needs such as-shelter</i>	Possession of dwelling unit
1Py7	<i>possession of cars, houses</i>	Possession of dwelling unit, physical assets
1Py8	<i>has peace of mind</i>	Sound mind

Concepts

Statements	Codes
Results oriented judgment and decision making process leading to productivity	1Pc1,1Py8
Demonstrate environmental and personal cleanliness	1Pc2,
Financial position and ability to cater for household basic needs	1Pc3, 1Pm5,1Py5; 1Pm1, 1Pm7,1Pw1,1Pw2,1Py2,1Py3
Demonstrating good relationship with neighbours and supporting community initiatives and individuals	1Pm2, 1Pm8
Ownership of livestock	1Pm3,
Possession of dwelling unit or ability to afford rent	1Pm4,1Py4,1Py6,1Py7
Ownership of land resources	1Pm6
Access to job and other income generating activities	1Py1,

Categories

Public goodwill 1Pc2, 1Pm2, 1Pm8
Natural resources 1Pm3, 1Pm6

Perception of Poverty

ID	Key	Code
1Pc1	<i>Unable to educate children</i>	Low financial position
1Pc2	<i>farm to provide for household</i>	rely on local opportunities
1Pc3	<i>Low education; unemployment</i>	Low education, inability to afford education of children
1Pm1	<i>cannot take care of himself and children</i>	Inability to cater for household
1Pm2	<i>no money to buy food or cloth</i>	Inability to take care of households
1Pm3	<i>Lacks shelter</i>	Lack of shelter
1Pm4	<i>Unable to move due to lack of money and so he /she is always locked up in thoughts/thinking</i>	Low financial position
1Pm5	<i>unable to acquire health insurance</i>	Low financial position
1Pw1	<i>the shelter shows</i>	Nature of dwelling unit
1Pw2	<i>where the children are shows</i>	Inability to cater for household
1Pw3	<i>live in thatch houses--</i>	Nature of dwelling unit
1Pw4	<i>indulge in small scale stone quarry to make money</i>	Engage in low income jobs
1Pw5	<i>Someone may be rich but situation can shift him/her into poverty</i>	Unexpected poverty
1Py1	<i>No job so struggles</i>	Lack of a job, Ability to cater for household
1Py2	<i>financial difficulty</i>	Lack financial capital
1Py3	<i>just about half of basic needs, struggle to feed family, borrows to feed</i>	inability to cater for household
1Py4	<i>poor shelter</i>	Nature of dwelling unit
1Py5	<i>has problem with living</i>	Inability to cater for household
1Py6	<i>has to assist someone before getting something to feed</i>	Inability to cater for household
1Py7	<i>difficult to feed, has no support</i>	Inability to cater for household
1Py8	<i>loss of job due to political changes</i>	Loss of job, political interference

Concepts

Statement	Codes
Financial position and inability to cater for household basic needs	1Pc1,1Pm4,Pm5,1Pc3;1Pm1,1Pm2,1Py5,1Py6,1Py7,1Py1
Dependency on local opportunity	1Pc2
Low educational and skill development	1Pc3
Nature of dwelling unit	1Pm3,1Pw1,1Pw3,1Py4
Lack of access to employment and other income generating activities	1Pw4,1Py1,1Py8, 1Py1
Unexpected events leading to poverty	1Pw5

Category

Financial resources 1Pc1,1Pm4,Pm5,1Pc3 1Pm1,1Pm2,1Py5,1Py6,1Py7,1Py1
Occupational opportunities 1Pc2, 1Pw4,1Py1,1Py8,

DZORWULU: ACCESS TO WATER

ID	Key point	Code
4Pc1	<i>Majority [what percentage?] of people have pipes in their homes and the flow is quite regular</i>	High level of connectivity Regular flow
4Pc2	<i>“There should be plans in place to collect and use rainwater”</i>	Rainwater harvesting
4Pc3	<i>“There should also be community reservoirs to serve emergency situations</i>	Community water reservoir Emergency situation
4Pc4	<i>Also the city authorities should install community “big tanks” to serve the community when flow stops</i>	Community water reservoirs
3Pc5	<i>The water contains particles, has bad scent, and changes colour of its container after a period”</i>	Water quality challenge
4Pc6	<i>“The pipe water received has quality problems-sometimes there is the presence of algae and dirt”</i>	Water quality challenge
3Pc7	<i>“The body requires good things, so water quality is very important to the community”</i>	Significant of water quality
4Pc8	<i>We cannot say whether there are diseases or not since we use only the visual impression which is not enough because several diseases cannot be seen</i>	Uncertain about water quality challenge
4Pw1	<i>The flow of water is quite regular</i>	Regular flow
4Pw2	<i>The pressure of the water is low on weekdays but is ok on weekends</i>	Low pressure of flow
4Pw3	<i>As a result inhabitants are coping by storing water in several ways</i>	Water storage

ID	Key point	Codes
4Pw4	<i>Why is there no prior announcement before the taps are closed</i>	Unannounced closure of taps
4Pw5	<i>Why are the water bills increased without our notice</i>	Low education on billing system
4Pw6	<i>Why is there discrimination on who should have water when two people owe the water company-</i>	Inequities in disconnections
4Pw7	<i>Why is it that we use less water and yet we pay so much</i>	Water cost expensive
4Pw8	<i>There are places where people use more water and yet they pay less, why</i>	Inequities in billing system
4Pm1	<i>No public taps in Dzorwulu. This is because in planned residential areas there are no public pipes, no waste disposal containers-</i>	No public water stand pipes
4Pm2	<i>There is no reserved land for the government to construct these things at Dzorwulu</i>	-
4Pm3	<i>Access to water is different because of the various categories of people at Dzorwulu: Uncompleted buildings, squatters residents, fast food joints, taps restricted to some people</i>	-
4Pm4	<i>Pressure of water in the morning is low</i>	Low pressure of water
4Pm5	<i>"I used to work with the GWCL. The key problem in the water sector is the population explosion-</i>	Urbanization having an impact on water supply
4Pm6	<i>The facilities were built to serve far fewer people than it serves today</i>	Urbanization having an impact on water supply
4Pm7	<i>Generally the water problem in Accra is a big issue because many communities still lack access to water</i>	Accra's water supply deficit
4Pm8	<i>The company should construct reservoirs to store water</i>	Community reservoirs
4Pm9	<i>Most people in the community rely also on their reservoirs such that they could fall on when the pipe stop flowing</i>	Individual household reservoirs
4Pm10	<i>When the pipes are not flowing and one has no water it makes life uncomfortable--</i>	Challenges of no flow
4Pm11	<i>Water shortages may go from 2-3 days</i>	Regular flow
4Pm12	<i>Water is too expensive</i>	Cost of water high
4Pm13	<i>The water bills that are submitted are often times controversial</i>	Disputes over billing system
4Pm14	<i>Billing systems need to be reviewed</i>	Review billing system
4Pm15	<i>People drive to the office of the GWCL to sort out bills with them-</i>	Complaints over billing system
4Pm16	<i>The bills do not correspond with the volume of water used</i>	Disputes over billing system
4Pm17	<i>Generally the water quality of potable water is good but one is suspicious about the pipeline</i>	Water quality challenge
4Pm18	<i>"Individual water lines go through muddy areas and as such when there is a break and are being repaired, dirt enters"-</i>	Pipe layout network source of contamination
4Pm19	<i>The quality is good because when we drink nothing happens</i>	Water quality in general good
4Pm20	<i>Water quality is poor when you drink and you have stomach aches-</i>	Knowledge of water quality
4Pm21	<i>Water quality is very important to the community</i>	Water quality important
4Pm22	<i>Sometimes the water is hard because it does not lather well with soap</i>	Water quality challenge

4Pm23	<i>One of them explained why this is so as sometimes when there is a break in the pipeline and there are delays in repairing it pollutants enter the pipeline-</i>	Water quality challenge
4Py1	<i>Broken pipes repeatedly not repaired, When this happens water is wasted</i>	Pipe network source of contamination
4Py2	<i>The flow of water is regular during the week</i>	Regular flow of water

Concepts

Statement	Codes
High level of connectivity to water supply pipe line	4Pc1
Possible measures in response to Accra's water deficit	4Pc2, 4Pc3,4Pc4,4Pm8,4Pm9,4Pm1,4Pm7,4Pm5,4Pm6
Layout of pipe network and the risk of water contamination	4Pc5,4Pc6,4Pc7,4Pc8,4Pm17,4Pm18,4Pm19,4Pm19,4Pm20,4Pm21,4Pm22,4Pm23,4Py1
Regularity and pressure of water supply	4Pw1,4Pw2,4Pm4,4Pm10,4Pm11,4Py2,4Pw4
Cost of water and transparency in the billing process	4Pw7,4Pw8,4Pm12,4Pm13,4Pm14,4Pm15,4Pm16

Factors influencing occupations

ID	Key point	Code
4Pc1	<i>The level of education influence choice of livelihood activity</i>	Level of education
4Pc2	<i>May be the parents are unable to help an individual to continue</i>	Lack of parental support
4Pc3	<i>I encourage the youth to school</i>	Level of education
4Pc4	<i>Poverty as a result of broken homes is also a factor</i>	Level of poverty Lack of parental support
4Pc5	<i>In this case the parent may only help to a certain point</i>	Lack of parental support
4Pc6	<i>Teenage pregnancy is also a cause</i>	Teenage pregnancy
4Pc7	<i>When it happens this way the wards are unable to continue and as such would give in to learn a trade such as hair dressing or sewing</i>	-
4Pc8	<i>Peer pressure is also a factor</i>	Peer pressure
4Py1	<i>The factors influencing the choice of livelihood activity is poverty</i>	Level of poverty
4Py2	<i>pressure from parents--2,</i>	Parental influence
4Py3	<i>peer pressure-</i>	Peer pressure
4Py4	<i>role models</i>	Role models
4Py5	<i>level of education which determines the capacity people have built</i>	Level of education Level of skill
4Py6	<i>The environment within which one lives and what most people actually do</i>	Influence from public

Concepts

Statement	Code
Educational and skill development level	4Pc1,4Pc2,4Pc3,4Py5
Financial and poverty status of household	4Pc4, 4Py1
Parental support and influence	4Pc4,4Pc5,4Py2
Peer and community influence	4Pc6, 4Pc8,4Py3,4Py4, 4Py6

Social networks/capital

ID	Key point	Code
4Pc1	<i>The Peswa Petty Traders Association was to offer opportunity to seek funding from MASLOC</i>	Occupational associations Liaise with funding agencies for support
4Pc2	<i>It is a “self help” group which helps members in times of stress</i>	Seasonal support to members
4Pc3	<i>The association receives dues from members</i>	Membership dues
4Pc4	<i>Yes an individual may be excluded from joining if he/she is quarrelsome, gossip, and a rumour monger</i>	Rules on exclusion
4py1	<i>There is the Dzorwulu residents association-</i>	Residents’ association
4Py2	<i>There is the keep fit club-</i>	Social association
4Py3	<i>Registration is 2 Ghana cedis and monthly dues are also 2 Ghana cedis</i>	Membership dues
4Py4	<i>. Members pay 5 Ghana cedis for the association T-shirt</i>	Membership
4Py5	<i>We offer some form of assistance through contributions when one is bereaved-</i>	Membership support
4Py6	<i>“The youth socialize more than the elderly, whose relationship is more on a hi-hi basis”-</i>	Community social capital
4Py7	<i>The Keep fit club occasionally organizes clean up exercises about once in a month--</i>	Communal labour

Concepts

Statement	Code
Support driven occupational associations	4Pc1, 4Pc2,4Pc3,3Pc4
Residents and social associations	4Py1,4Py2,4Py3,4Py4,4Py5,4Py6,4Py7

Perceptions, attitudes and behaviour to surface water

ID	Key point	Code
4P2c1	<i>“The river [water] is “bad” and this has been caused by the fitting shops along the river</i>	?
4Pc2	<i>defecation along the river-</i>	Possible open defecation
4Pc3	<i>wastewater intrusion</i>	Wastewater
4Pc4	<i>The nature of pollution influences the surface water quality</i>	Nature pollution
4Pw1	<i>There is no river passing through Dzorwulu, It is a gutter</i>	Functional drain
4Pw2	<i>At first the water flowing in the community was good but following development of settlement it is no longer good</i>	Physical impression Historical change in quality Consequence of urbanization
4Pw3	<i>In the past we used to wash there but not today</i>	Historical change in uses
4Pw4	<i>The water quality is bad because it contains worms, frogs, the surroundings are poor, contains rubbish, and breeds mosquitoes</i>	Solid waste disposal

ID	Key point	Code
4Pw5	<i>The water currently can be used for construction, flush toilet, and wash cars</i>	Possible current uses
4Pw6	<i>The responsibility falls on the squatters and people living in uncompleted houses. Those who are into farming do defecate around</i>	Non residents are perceive to be behind pollution along the river
4Pw7	<i>Those near where bush exist throw rubbish in them</i>	Solid waste disposal
4Pw8	<i>“This is a first class residential area so there are no rubbish containers</i>	Community disallows public bins
4Pw9	<i>Sometime ago, about 8 years, a container was placed near the farm sites, but was removed following complaint by one of the residents about the stench emanating from it-</i>	Past experience
4Pw10	<i>“No indiscriminate defecation occurs in Dzorwulu except near the high tension areas”</i>	Limited open defecation
4Pw11	<i>We have not heard of any education by anybody to protect surface water</i>	?
4Pw12	<i>Almost all who live in completed houses have access to sanitation</i>	High access to toilets
4Pw13	<i>“On rubbish disposal, those who are not registered with Zoomlion rely on the “donkey man”</i>	formal and informal solid waste disposal
4Pw14	<i>We do not know if AMA bears any part of the cost</i>	?
4Pm1	<i>Yes there is a river flowing from the ridge and formerly one could see water snails in the river</i>	Water body considered a river
4Pm2	<i>You cannot use it for cooking, bathing, or washing</i>	Current uses
4Pm3	<i>The squatters pollute the water with rubbish and other dirty things</i>	Squatters contribution to pollution load
4Pm4	<i>The squatters defecate and throw rubbish into the river</i>	Squatters contribution to pollution load
4Pm5	<i>Gutters get choked when it rains</i>	Choked drains
4Pm6	<i>Some pour rubbish into the gutter</i>	Solid waste disposal
4Pm7	<i>In Dzorwulu if your building has no footing, the surroundings flood</i>	Local flooding
4Pm8	<i>Different companies manage waste in Dzorwulu</i>	Involvement of formal waste management companies
4Pm9	<i>The rubbish collection companies have few vehicles which delay the rubbish collection</i>	Squatters contribution to pollution
4Pm10	<i>People living in uncompleted houses lack access to sanitation and what they do is to defecate around</i>	Squatters contribution to pollution
4Pm11	<i>Areas around some houses do flood when it rains-</i>	Local flooding
4Pm12	<i>The community does organize regular clean-up exercises, usually carried out by the keep fit clubs</i>	communal labour in cooperation with social associations
4Py1	<i>Some thought there is no river in the community while others thought otherwise</i>	Opinion divided on the whether it is a river or drain
4Py2	<i>Poor quality river cannot be used to wash--2, however can be used to water vegetables</i>	Current uses
4Py3	<i>, people defecate around such water body</i>	Open defecation around river
4Py4	<i>rubbish dumped into such rivers</i>	Solid waste disposal

ID	Key point	Code
4Py5	<i>the colour is also black</i>	Physical impression
4Py6	<i>it is clean, colourless, the environment is clean</i>	Physical impression
4Py7	<i>Most people have WCs in their house</i>	High access to toilets
4Py8	<i>Farmers along the river are responsible for any pollution in the river</i>	Role of farmers in pollution unclear
4Py9	<i>Some parts of Dzorwulu become muddy when it rains due to the nature of the soil--8. Some gutters are also choked with plastics</i>	Local flooding
4Py10	<i>People living in kiosks are responsible for the pollution of the river</i>	Pollution contribution of squatters
4Py11	<i>Where there are bushes around. All the environment problems are important</i>	-
4Py12	<i>choked gutters and pollution</i>	Choked drains
4Py13	<i>About 90% of residents have access to water closets</i>	High access to toilets
4Py14	<i>Those who have no access to sanitation use the drains/ the rivers</i>	Pollution contribution from squatters
4Py15	<i>Residents pay between 10 -15 Ghana cedis/month to access garbage disposal services by the Zoomlion Company-</i>	Involvement of formal companies in solid waste management

Concepts

Statement	Code
Perception of water quality based on physical impression	4Pc3,4Pc4,4Pw1,4Pw2,4Pm1,4Py1,4Py5,4Py6
Historical changes in uses of water in relation to quality	4Pw2,4Pw3
Current and prospective uses of water if improved	4Pw5, 4Pm2,4Py2
Observed and hidden behaviour, practices and patterns of solid and human waste disposal leading to pollution	4Pw6, 4Pm4, 4Pm3,4Pm9, 4Pm10, 4Py4, 4Py10, 4Py14; 4Pc2, 4Pw4,4Pw7, 4Pw8,4Pw9, 4Pw9,4Pw10,4 Pw12, 4Pm5,4Pm6, 4Py4, 4Py7 4Py3
Engaging the services of formal and informal solid waste collectors	4Pw13,4Pm8,4Py15
Community local flooding challenges	4Py9,4Pm11
Educating and creating awareness for pro-environment behaviour	3Pw11
Community participation water and environmental pollution control	4Pm12

Categories

Constructs of water quality

4Pc3,4Pc4,4Pw1,4Pw2,4Pm1,4Py1,4Py5,4Py6 ; 4Pw2,4Pw3; 4Pw5, 4Pm2,4Py2

Influencing perceptions, attitudes, behaviour

ID	Key point	code
4Pc1	<i>People along the banks are responsible for the water pollution</i>	Pollution contribution of squatters
4pc2	<i>“There is need for education to explain to the community the consequences of pollution</i>	Education of community members
4Pc3	<i>“There are no public toilets in this community and the AMA should consider constructing one</i>	Need for public toilet
4Pc4	<i>However we acknowledge that land to construct it will be a problem</i>	Land to construct public facility a problem
4Pc5	<i>We know that the AMA is in charge of waste management and as such should provide containers for waste disposal</i>	Provide open bins for solid waste collection
4Pc6	<i>People still consider the streams as nothing more than a gutter</i>	River considered a drain
4Pc7	<i>There should be radio programmes to educate the population-</i>	Employ the media to educate the population
4Pc8	<i>therefore if there is security this can be changed</i>	Set up a community watchdog
4Pc9	<i>Offenders should also be prosecuted</i>	Prosecution of offenders
4Pc10	<i>An education plan was rolled out and a container provided for the community to dump waste into it</i>	-
4Pc11	<i>Almost 100% of residents have toilets in their homes</i>	High access to toilet
4Pc12	<i>There is only one KVIP owned privately</i>	-
4Pc13	<i>There are household rubbish containers in individual houses</i>	High patronage of formal collection services
4Pc14	<i>These are taken for disposal by the Zoomlion waste management company as a result of which indiscriminate dumping of refuse or rubbish is on a very low scale</i>	Limited and open disposal of solid waste Formal involvement in waste management
4Pc15	<i>“There is also an informal waste collector known as a “donkey man” because he uses a donkey to cart waste from households that are not registered with any waste management company</i>	Informal involvement in solid waste management
4Pc16	<i>“Any time it rains some parts of the community floods for about 2 hours before one can go out</i>	Local flooding
4Pc18	<i>On holidays the community organizes a clean up exercise sometimes and basically individuals are expected to clean their own surroundings</i>	Communal labour
4Pc19	<i>The initiative is spearheaded by the Assembly woman in the area</i>	Assembly woman’s involvement in communal labour
4Py1	<i>To change behaviour there is the need for educational campaigns to be run</i>	Educational campaign
4Py2	<i>Provide waste bins for the residents</i>	Provision solid waste bins
4Py3	<i>Clear and clean the drainage area</i>	
4Py4	<i>The city authorities should arrest and prosecute offenders</i>	City involvement in the arrest and prosecution of offenders
4Py5	<i>Employ the mass media and use of the internet as well</i>	Education through the mass media

Concepts

Statement	Code
Creating awareness and educating community members	4Pc2,4Pc7,4Py1,4Py5
Promoting efficient solid waste collection service by formal and informal	4Py2,4Pc5
Community participation in water and environmental resource management and pollution control	4Pc8, 4Pc18,4Pc19
Active city participation in the enforcement of laws on sanitation and environmental pollution control engenders behaviour	4Pc9,4Py4, 4Pc3, 4Pc4,4Pc11

Perception of wealth

ID	Key point	Code
4Pc1	<i>One who is in good living has good health</i>	Health status
4Pc2	<i>good personal hygiene</i>	Personal hygiene
4Pc3	<i>lives in a clean environment, enjoys three square meals</i>	Sensitive to environmental cleanliness Ability to afford meals
4Pc4	<i>has a good job</i>	Employment
4Pc5	<i>special security[in terms of savings, social security, assets , insurance]</i>	Financial investments
4Pw1	<i>Good living means that you have money, everything, cars, land, nothing worries you, good health, glory, no needs, not in difficulty</i>	Financial position, Owns means of transport, natural assets such as land, mental state, Health status, ability to cater for household
4Pw2	<i>Living in wealth is not to depend on others</i>	Independence
4Pw3	<i>to have self sufficiency, can afford meals, and live on your own</i>	Independence, ability to afford meals
4Pm1	<i>The community does organize regular clean-up exercises, usually carried out by the keep fit clubs</i>	--
4Pm2	<i>Good living is to be able to afford rent-</i>	Ability to afford cost of dwelling unit
4Pm3	<i>Good living is to be able to afford rent</i>	-
4Pm4	<i>have a job</i>	Employment
4Pm5	<i>good salary</i>	Income from job
4Pm6	<i>Wealth is seen by the way the person carries him or herself about</i>	Personality
4Pm7	<i>has mansions--</i>	Ownership of dwelling unit
4Pm8	<i>actions, cars, rich</i>	Material possessions
4Py1	<i>Good living is when the person has little and yet is happy with it</i>	Contentment with assets
4Py2	<i>It is not necessarily being rich--</i>	-
4Py3	<i>Having education</i>	Access to education
4Py4	<i>good sleep</i>	Sound sleep
4Py5	<i>shelter, and job, one who is happy about what he she does</i>	Ability to afford cost of dwelling unit, employment, contentment with employment
4Py6	<i>He who lives in wealth has everything in life</i>	Lacks nothing
4Py7	<i>has place of his own</i>	Owns a dwelling unit
4Py8	<i>own cars, investments-, has various things, well to do, good reputations, savings, self reliant-, fulfilling family obligation-- , jobs-- , houses, cars-- , children in good schools-- , self confidence-- , contributes to the needy in society, and church activities</i>	Ownership of a car, Investments, recognition, financial investments, ability to take care of the family, employment, ability to take of household, charitable

Concepts

Statement	ID
Health and mental status enabling productivity	4Pc1,4Pw1,4Py1,4Py4,4Py5
Demonstrating environmental and personal cleanliness	4Pc2,4Pc3,4Pm6
Financial position	4Pc5,4Pw1,4Pw2,4Pw3,4Pw3,4Pm2,4Pm5,4Py5,4Py8
Access to job and other available income generating opportunities	4Pc4,4Pm4,4Py5,4Py8
Ownership of means of transport	4Pw1,4Py8
Possession of land resources	4PW1
Possession and ability to afford cost of dwelling unit	4Pm7, 4Py5,4Py7
Education and skill development level	4Py3
Recognition and public approval resulting from charitable acts	4Py8

Perception of poverty

ID	Key point	Code
3Pc1	<i>In addition lacks spiritual, mental and health well being</i>	Lacks spiritual well-being Lacks mental well-being Poor health status
3Pc2	<i>The dressing is evident</i>	Physical appearance
3Pc3	<i>Some of the things which have trapped people in poverty over the years are drunkenness, joblessness, and victims of robbery</i>	Trappings: recklessness; lack of employment, victims of robbery
3Pw1	<i>Bad living means you have no strength to even go and work</i>	Poor health status
3Pw2	<i>Poverty means that you have no money, no cloth, have nothing, can't educate your children, and can't afford health care</i>	Lack financial abilities, physical appearance Unable to take care of household
3Pw3	<i>The poor are usually identified by their walking, dressing, speech</i>	Physical appearance or personality
3Pw4	<i>lack of strength to work</i>	Poor health status
3Pw5	<i>cannot afford basics of life</i>	Inability to take care of household
3pw6	<i>There are those who live in extreme poverty who resort to begging</i>	Copping by begging
4Pm1	<i>Bad living is not having a job-</i>	Lack of employment
4Pm2	<i>sleep in kiosks</i>	Lack of shelter
4Pm3	<i>unemployed--</i>	Lack of employment
4Pm4	<i>Poverty is inadequacy of income that affects you</i>	Low income status
4Pm5	<i>your children cannot go to school</i>	Inability to cater for household
4Pm6	<i>and your income position defines your poverty status</i>	Low income status
4Pm7	<i>The poor are identified by their outfit</i>	Physical appearance
4Pm8	<i>their skin, health status, dress</i>	Physical appearance
4Pm9	<i>mental make up</i>	Mental state
4Pm10	<i>buy food without fish</i>	Inability to afford balanced meals

ID	Key point	Code
4Pm11	<i>People are trapped in poverty because of where the person is coming from-- , educational background, unfortunate ones who may not fall in good family, some are dishonest people, students who have squandered their fees, personal</i>	Trappings; family background; educational background; dishonesty
4Pm12	<i>Coping-eat twice a day, do some extra work</i>	Coping: reduce frequency and quality of food; seek extra working hours
4Py1	<i>Bad living in is living in mansions which were illegally acquired--</i>	-
4Py2	<i>lack of peace--</i>	-poor mental state
4Py3	<i>One living in poverty is one who does not have what he needs</i>	Inability to cater for household
4Py4	<i>from hand to mouth</i>	Lack of investments
4Py5	<i>, lack of shelter</i>	Lack of shelter
4Py6	<i>The poor are identified by their dress</i>	Physical appearance
4Py7	<i>Food they eat</i>	Inability to afford balanced meal
4Py8	<i>their style of living, places they go</i>	Low living standards
4Py9	<i>inability to take full responsibility of family, relationship between husband, wife and children bad</i>	Inability to cater for households
4Py10	<i>What has trapped people in poverty is lack of planning, disasters-floods, inadequate research-</i>	Trappings: lack planning of life,
4Py11	<i>The poor are coping by depending on daily wages from labourer activities. Some also are into begging</i>	Coping: daily wages as labourer

Concepts

Statement	Code
Health and mental state enabling productivity	4Pc1, 4Pw1,4Pw4,4Pm9,4Py2
Demonstrating environmental and personal cleanliness	4Pc2,4Pw3,4Pm7,4Pm8,4Py6
Involvement in reckless life style and social vices [trappings]	4Pc3
Financial position and inability to cater for households	4Pw5,4Pm4,4Pm5,4Pm6,4Pm10,4Py3,4Py7,4Py9,4Py8,4Py4
Coping by begging and borrowing from friends and family	4Pw6
Access to jobs and other available income generating opportunities	4Pm1,4Pm3
Lack of dwelling unit	4Pm2,4Py2
Low education and skill level	4Pm11
Nature of family background	4Pm11
Reduced frequency and quality of food[coping]	4Pm12
Working extra hours to make additional income	4Pm12, 4Py11
Lack of planning for life[trappings]	4Py11

Category

Lack of Financial resources 4Pm12; 4Pw6; 4Pw5,4Pm4,4Pm5,4Pm6,4Pm10, 4Py3,4Py7,4Py9,4Py8,4Py4
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SABON ZONGO

Access to water

ID	Key point	Code
10Pc1	<i>Majority of residents have pipe connection in the house</i>	??—average connectivity
10Pc2	<i>We have no idea of how much one needs to pay to get connected to GWCL pipe line</i>	Cost of connectivity
10Pc3	<i>The water flow is quite regular</i>	Regularity of flow
10Pc4	<i>Generally, the water situation is bad as people report on radio phone in programmes and mention places such as Nima, Awoshie [Participants seemed unperturbed by the current state of access</i>	General water problem of Accra
10Py1	<i>The rest of the households without pipe connection access water from neighbours</i>	Access water from neighbours
10Py2	<i>We have no idea of how much it cost to be connected to the GWCL pipeline</i>	Lack of knowledge of cost of connectivity
10Py3	<i>We suffer to access water because we have to move to far distance to fetch water [over 2km] when pipes are not flowing</i>	Challenges of lack of flow
10Py4	<i>Once we do not have water for domestic activities the place becomes dirty and we have to depend on bagged water [500 ml each / also know as pure water] to bath</i>	Water dependent services affected
10Py5	<i>This is much costly as a pack of the pure water is sold at 70 peswas. When the taps are not flowing, food vendors do not have enough water so their plates are not well washed-</i>	Challenges of lack of flow
10Pw1	<i>Water supply is irregular</i>	Irregularity of flow
10Pw2	<i>When the pipes are not flowing we move to nearby communities (Kaneshie, Abossey Okai etc) to fetch water</i>	Challenges of no flow
10Pw3	<i>It takes about 30minutes walk to the place and with about 20 minutes of waiting time. We pay 10p/yellow gallon and 5p/34 size bucket. About 25% of households have in-house pipes</i>	Limited connectivity Challenges of no show
10Pw4	<i>3. The rest of the population fetches water from community showers, neighbours' pipe-</i>	Non connected access water from neighbours
10Pw5	<i>The toilet care taker increases the fee from 10p to 15p because taxis would have to cart water to be used in cleaning--</i>	Challenges of no flow periods
10Pw6	<i>We understand such situations and willingly pay the extra cost coming from the water</i>	Cost of water during no flow periods
10Pw7	<i>It also affects the preparation of drinks for vending. The prices of pure water go up when the pipes are not flowing-</i>	Challenges of no flow periods
10Pw8	<i>Most of the water dependent activities adjust their prices to make up for the extra cost of getting waterp-8</i>	Challenges of no flow periods
10Pw9	<i>The water unexpectedly stops flowing and sometimes the smell of chemicals is strong in the water-</i>	Unscheduled stops a source of worry
10Pm1	<i>The water flow has been quite regular until recently when a major pipe line was broken</i>	Regularity of flow
10Pm2	<i>We pay about 10p/yellow gallon and this is reasonable. About 50% of households may have pipe connection</i>	Limited connectivity
10Pm3	<i>The rest of the households fetch water from public stand pipes</i>	Non connected dwelling units fetch from neighbours
10Pm4	<i>I think that there is a general water problem in Accra</i>	Water deficit of Accra

Concepts

Statement	Code
Limited connectivity and cost of connecting to the pipeline	10Pc2,10Pm2,10Pw3,10Py2 10Py1,10Pw4,10Pw5,10Pm3
Regularity of tap water supply	9Pc3,9Pw1,9Pm1
High expectations for GWCL to act in addressing supply deficit	9Pc4,9Pm4
Challenges of unscheduled tap water flow cuts	9Py3,9Py4,9Py5,9Pw2,9Pw3 9Pw5,9Pw6,9Pw8,9Pw9

Factors influencing occupations

ID	Key point	Code
10Pc1	<i>that the predominant factor in determining what one can do is education-</i>	Level of education
10Pc2	<i>Those without education learn a trade to get something for a living</i>	Level of education
10Pc3	<i>Age is also a factor</i>	Age
10Pc4	<i>The youth have a lot of energy so they do a lot of manual work</i>	Age
10Pc5	<i>Gender is also a factor</i>	Gender
10Pc6	<i>Women youth only are hair dressers</i>	Gender
10Pc7	<i>Some of the men are also into tailoring". "Education is a factor, so you may push yourself into "hand learning job" or the "technical aspect</i>	Gender
10Py1	<i>When your parents are in that job and they initiate you into it</i>	Parental influence
10Py2	<i>One's interest and the expected income from an activity and the fact that it enables one to make a living influences choice of particular livelihood activity</i>	Personal interest and ambition
10Py3	<i>Those who want fast money go into business</i>	Desire for quick returns
10Py4	<i>Some for lack of money go into business to save some money and then go back to school</i>	Coping strategy
10Py5	<i>Others go to learn a trade, make money and stop and do business--</i>	Coping strategy
10Py6	<i>Others may have no parental support and as such remain unemployed and thus be fed by the parents</i>	Lack of parental support
10Py7	<i>Some people simply don't want to work</i>	Laziness
10Py8	<i>For others do to challenges at the work. It is difficult to get a job</i>	Lack of opportunities in the formal sector
10Pw1	<i>cause people to take one livelihood option or the other depend on the level of education</i>	Level of education
10Pw2	<i>The financial problems of the person are also one factor</i>	Financial position
10Pw3	<i>"The others are lack of parental care, broken homes, and peer pressures</i>	Lack of parental care Peer influence
10Pw4	<i>Some are just stubborn</i>	Uncooperative behaviour
10Pw5	<i>For some people their choices are based on envy, may be your friend has made money in business and since schooling takes time to bring money , you drop out of school to do business in order to compete with the person</i>	Selfish ambitions

Concepts

Statement	ID
Level of education and skill development	9Pc1,9Pc2,9Pw1
Age and gender as determinants of occupational choices	9Pc3,9Pc4,9pc5,9Pc6,9Pc7
Household and external support and influence	9Py1,9Py6,9Pw3
Personal talents and ambitions leading to entrepreneurial development	9Py2,9Pw5,9Py3
Occupational choices as coping strategy	9Py4,9Py5
Behaviour and attitudes leading to unproductivity	9Py7
Lack of opportunities in the formal employment sector	9Py8
Lack of cooperation with parent or guardian leading to neglect	9Pw4
Financial position and poverty status	9Pw2

Social networks/capital

ID	Key point	Code
10Pc1	<i>Community members live at peace with each other</i>	Cordial relationship among community members
10Py1	<i>Associations in the community include: Mallam ways which preach on Islamic ideals, non Muslim excluded, Sisse-faith based, Jelo-faith based, Naziac-footall associations-females are excluded, those who are not neat, not disciplined, Gambu Footballers Association, Bafanna</i>	Social associations
10Pw1	<i>Some of the Associations are PPAG, Peer educators, Makola Youth Club, Community Youth</i>	Social associations
10Pw2	<i>Informally the Assembly woman organizes the Youth for work</i>	Communal labour
10Pm1	<i>There are quite a number but two Islamic ones are Yapi and Ramani</i>	Religious associations

Concepts

Cordial relationships among community members	9Pc1,
Residential and social associations	9Py1,9Pw1,9Pw2
Religious associations	9Pm1

Perceptions, attitudes and behaviour to surface water

ID	Key point	Code
10Pc1	<i>For surface water, bad water is polluted with toxic waste, plastic rubbers as a result of "lack of maintenance by city authorities</i>	Physical impression Behaviour /attitudes leading to pollution
10Pc2	<i>"We think that currently the water body is a mere drainage and not a river</i>	Water functional drain
10Pc3	<i>The stench is also detrimental to human health</i>	Physical impression
10Pc4	<i>Kids are playing around and could affect them</i>	Perceived health consequence on vulnerable group
10Pc5	<i>Animals also drinking from it may transfer diseases to man</i>	Perceived health consequence from livestock contact

ID	Key point	Code
10Pc6	<i>It is perceived that Zongo is a dirty place</i>	Behaviour and attitudes leading to pollution
10Pc7	<i>This is true, it is a dirty place</i>	- Behaviour and attitudes leading to pollution
10Pc8	<i>But it does not mean that Zongo people are dirty</i>	Behaviour and attitudes leading to pollution
10Pc9	<i>It is poverty that has made it so; More policies needed to address poverty in “Zongos--</i>	-
10Pc10	<i>The toilets are not clean enough</i>	Unhygienic conditions of public toilets
10Pc11	<i>There is too much exposure</i>	Disposal of human waste
10Pc12	<i>The gutters are not distilled regularly and as such are choked</i>	Improper maintenance of drains
10Pc13	<i>Improper disposal of faeces occur and measures are needed to address this-</i>	Behaviour leading to pollution Disposal of human waste
10Pc14	<i>The environment is unsanitary</i>	-
10Pc15	<i>Residents are responsible for the situation</i>	Contribution from community
10Pc16	<i>The drains eventually connect to the Odaw-Korle system</i>	Contribution from the community
10Pc17	<i>City authorities should manage the situation around the lagoon area and education of residents carried out-</i>	Education and creating awareness Enforcement of laws pollution control
10Pc18	<i>About 9% of houses may have toilets-pan latrines</i>	Limited use of waterless systems in dwelling units
10Pc19	<i>The rest access public toilets-</i>	Limited household toilets leading to high patronage of public toilets
10Pc20	<i>There are 6 public toilets (constructed by government) and about 20-30 (10 seater capacity) of other public toilets owned and operated by individuals</i>	Formal and informal involvement in toilet provision
10Pc21	<i>Residents pay 10p/person to access the toilets. Some people are excluded because they cannot pay. Such people “bag” the faeces and keep in the house till night and dump into the gutter</i>	Disposal of human waste Inability to afford cost of access to toilet Behaviour leading to pollution
10Pc22	<i>There are containers for rubbish collection. Residents pay between 20 and 50p depending on the volume of rubbish. Those who cannot afford to pay this amount do litter the environment</i>	Formal involvement in solid waste collection Inability to afford cost of disposal
10Pc23	<i>One container is near one of the toilets. There are about 4 containers in the community and run by caretakers who are supervised by the Assembly woman. The Assembly woman in turn accounts for the proceeds to the AMA. The containers are emptied by the AMA regularly. Those who are unable to pay for disposal of rubbish are sent back</i>	Formal involvement solid waste collection Inability to afford cost of disposal
10Pc24	<i>Occasionally, the area boys (youth) organize to clean the community [fortnight?] without any support--</i>	Communal labour Lack of support for lean –up youth groups
10Py1	<i>“Good Quality River has no rubbish at the edges</i>	Physical impression

ID	Key point	Code
10Py2	<i>"You can see your face in the water, No particles in the water--"</i>	Physical impression
10Py3	<i>Poor river quality is judged by the presence of faeces, rubbish, intrusion of hospital waste and effluent from the mortuary</i>	Wastewater intrusion Physical impression
10Py4	<i>The rubbish in the containers is not collected at the right time-</i>	Inefficient collection of waste
10Py5	<i>"The practice in the community is that some people dump rubbish in the surroundings when it is raining"</i>	Behaviour leading to pollution
10Py6	<i>Some people have constructed pan latrines in their houses and have pipes which lead from the house to the gutters, and what these people do is to pour the faeces into the pipes at night</i>	Practices leading to pollution Human waste disposal
10Py7	<i>Others also bag the faeces and place it on people's roofs or in the streets and gutters</i>	Behaviour leading to pollution Human waste disposal
10Py8	<i>Food is sold in very unhygienic conditions-</i>	Environmental health concerns
10Py9	<i>This may result in mosquito breeding and typhoid fever</i>	-Environmental health concerns
10P10	<i>There is a container for rubbish collection and residents pay between 20 and 50 p depending on the size of the rubbish</i>	Formal solid waste collection Cost of solid waste disposal
10Py11	<i>"There are some area boys in the community called "junkers", these are drug pushers, their minds are not correct". "What they do is also to go round households with sacks to collect rubbish for disposal". These mainly dump the rubbish near the Korle Lagoon area or leave the bags behind people's residence--"</i>	Informal solid waste collectors Behaviour leading to pollution by informal collectors
10Py12	<i>The waste management company called Zoomlion cleans only the main street and not the community. "People also dump into the gutter during midnight"</i>	Hidden behaviour leading to pollution
10Py13	<i>About 20% of the houses have pan latrines and 80% access public toilets owned by individuals</i>	Limited waterless toilets in dwelling units High patronage of public toilets
10Py14	<i>Children pay 5p. Parents with faeces in chamber pots are expected to also pay</i>	-
10Py15	<i>Some people fail to pay access sanitation services, either because they have no money or are acquainted with a care taker of the place</i>	Cost of accessing the toilet Inability to afford
10Py16	<i>We have seen some campaigns on the television and head on radio as well regarding protection of water resources</i>	Educational campaigns on pollution
10Py17	<i>The areas flood due to the poor drainage systems</i>	Local floods Blocked drains
10Pw1	<i>Good Quality River is clean, there is no filth in it, no faeces in it, and no rubbish in it, the water is not black in colour</i>	Physical impression Solid and human waste disposal into drains Behaviour leading to pollution
10Pw2	<i>Poor river quality is full of filth, rubbish, faeces, and black in colour</i>	Physical impression Solid and human waste disposal into drains Behaviour leading to pollution

ID	Key point	Code
10Pw3	<i>River water quality is important for this community because of our livestock and for the farmers in this community-</i>	Perceived health consequence from use for livestock and farming
10Pw4	<i>There are some “area boys” in this community called “junkers”. They go round houses to collect rubbish in sacks at a fee”. “Some convey the rubbish to the environs of the Korle lagoon and others dump them behind people’s houses”</i>	Informal involvement in solid waste collection Behaviour by informal collectors leading to pollution
10Pw5	<i>There is also indiscriminate defecation around the community</i>	Behaviour leading to environmental pollution Human waste disposal
10Pw6	<i>Others also bag faeces and throw them around</i>	Human waste disposal Behaviour leading to pollution
10Pw7	<i>When the public toilets are being desludged , the stench from it is unbearable</i>	-
10Pw8	<i>Rain carries rubbish from other places to the community as well leading to local flooding</i>	Local flooding
10Pw9	<i>There is a container in the section of the community for rubbish collection. Ideally is free because was placed there by the AMA. However there are some of the youth who have organized themselves and take money from the residents-</i>	Formal collection of solid waste Illegal fees on solid waste disposal
10Pm1	<i>”We have not heard of any campaign to protect surface water</i>	Campaigns on pollution prevention
10Pm2	<i>is a big drain-</i>	Functional drain
10Pm3	<i>The community contributes to the total pollution load to the Odaw River trough drains linking to the river and the activities of junkers who lift garbage from the community to the banks of the river</i>	Community contribution to pollution load behaviour leading to environmental pollution
10Pm4	<i>There is flooding within the community when it rains</i>	Local flooding
10Pm4	<i>The gutters are full of rubbish</i>	Blocked drains
10Pm5	<i>Junkers collect rubbish and indiscriminately dump in the community</i>	Informal involvement in solid waste collection Behaviour leading to pollution
10Pm6	<i>Secondly the gutters are full of empty pure water and other plastic bags and thus affecting flow of water in it</i>	Blocked drains Wastewater flow in drains restricted
10Pm7	<i>People have the habit of pouring household rubbish in the wastewater before pouring them in the gutters</i>	Behaviour leading to pollution Solid waste disposal
10Pm8	<i>Junkers are drug pushers</i>	Informal collectors are drug users and peddlers
10Pm9	<i>Those who sell the drugs in the community are often arrested and yet return to the community after three or so days</i>	Past efforts to arrest drug peddlers failed
10Pm10	<i>Junkers are thieves as well</i>	Informal collectors engage in social vices
10Pm11	<i>They can steal anything their hands get hold of</i>	Informal collectors engage in social vices
10Pm12	<i>I also think that the drainage system is poor and needs improvement</i>	Inadequate capacity and number of drains
10Pm13	<i>These problems affect our families</i>	Challenge of environmental

		pollution
ID	Key point	Code
10Pm14	Indiscriminate disposal of rubbish and faeces are key problems to the community	Disposal of solid and human waste Challenges of environmental pollution
10Pm15	There are some public toilets built by individuals	Informal involvement in the provision of public toilets
10Pm16	There are others [these are bigger than what individuals have built] built by the government and leased to individuals to manage them and then account to government	Formal provision of public toilets
10Pm17	People who cannot afford to pay to access the toilets go to the environ of the Korle Lagoon to access open defecation-	Inability to afford cost of toilet Behaviour leading to pollution Disposal of human waste
10Pm18	Communal activities used to take place during the era of the NDC government but not the current government	Relaxed communal labour

Concepts

Statement	ID
Perception of water quality based on physical impression	9Pc1,9Pc3,9Py1,9Py2,9Py3,9Pw1,9Pw2,9Pc2,9Pm2
Open and hidden behaviour and practices and patterns of solid and human waste disposal leading to water and environmental pollution	9Pc15,9Pc16,9Pm3,,9Pc1,9Pc6,9Pc7,9Pc8,9Pc13,9Pc21,9Py5,9Py7,9P11,9Py12,9Pw1,9Pw2,9Pw4,9Pw5,9Pw6,9Py6,9Py9,9Py8,9Pm13,9Pm14,9Pc22,9Py10,9Pw9
Low hygienic condition of public toilet promotes behaviour that pollutes the environment	9Pc10
Perceived health consequence from contact by vulnerable groups	10Pc4
Perceived health consequence on livestock	10Pc5, 10Pw3
Drainage designs and construction restricting the flow of wastewater leading to local flooding after rainfall	9Pc12,9Pw8,9Pm4,9Py17
Lack of law enforcement on sanitation and environmental pollution control	9Pc17,9Pw9
Limited access to household toilets leading to high patronage of public toilets	9pc18,9Pc19,9Py13,9Py15,9Pm17
Formal and informal participation in the provision of public toilets in the community	9Pc20,9Pm15,9Pm16
Formal and informal participation in the provision of solid waste collection services in the community	9Pc22,9Pc23,9Py10,9Py11,,9Pw4,9Pw9,9Pm5,9Pm8,9Pm9,9Pm10,9Py4
Community participation in water and environmental pollution control	9Pc24,9Pm18

Influencing perceptions, attitudes, behaviour

ID	Key point	Code
10Pc1,	<i>The community will respond to a call on behaviour change</i>	Community to respond to behaviour change
10Pc2	<i>However, this will be difficult if the person is from the community-</i>	External involvement in behaviour change programmes hold prospects
10Pc3	<i>If AMA officials come, they will be listened to because they are known to be government officials and can cause arrest of people</i>	High probability that community will work with city authority
10Pc4	<i>The community is likely to listen to strangers or people coming from outside the community</i>	Community will cooperate with external agents of change
10Pc5	<i>“If you are in the community, you are seen as one of them, so they will not listen to you</i>	Community members may find it difficult as agents of change
10Pc6	<i>AMA has to sensitize people to act well</i>	Educate and create awareness
10Pc7	<i>Lack of education-intensifying education on sanitation with appropriate interventions by AMA officials</i>	Educate and create awareness by city authorities and other agencies Ensuring efficient collection of solid waste and management of public toilets
10Pc8	<i>Also the educated in the community should lead exemplary lives</i>	Promote exemplary practices and behaviour
10Pc9	<i>They see you as “their light--</i>	Promote exemplary behaviour and practices in the community
10Pc10	<i>“AMA to liaise with the educated in the community</i>	Involve the educated in interventions
10Pc11	<i>Sometimes we talk about indiscriminate rubbish disposal or littering and they will insult us--11</i>	Uncooperative and hostile attitudes of polluters Behaviour leading to pollution
10Py1	<i>The causes of these poor behaviours are as a result of lawlessness--</i>	Address lawlessness to promote pro-environmental attitude
10Py2	<i>The elderly who have no one to assist may also dump indiscriminately</i>	Promote community support for the elderly solid waste disposal
10Py3	<i>Poverty is also a factor</i>	-
10Py4	<i>Changes work for about a week and works no more</i>	Make interventions sustainable
10Py5	<i>Some may not be able to go to the toilet at midnight so may bag it and dump into the nearest gutter</i>	Behaviour leading to pollution Disposal of human waste
10Py6	<i>To some people defecating in the open is done because the place is airy and there is too much heat in the public toilet</i>	Behaviour leading to pollution
10Py7	<i>Some may not have money to simply afford</i>	Inability afford cost of sanitation and solid waste disposal
10Py8	<i>Others deliberately do that--</i>	Behaviour leading to pollution
10Py9	<i>There is also lack of youth leaders</i>	Youth leaders need to be identified to play active role
10Py10	<i>To change indiscriminate dumping by the “Junkers” , individuals must send the rubbish to the containers themselves”</i>	Control activities of informal collectors Individuals to avoid services of informal collectors
10Py11	<i>“The gutters should be widened and covered #</i>	Improve drainage network

ID	Key point	Code
10Py12	<i>The laws on sanitation and waste management should be applied and the road networks developed</i>	Enforce laws
10Py13	<i>If the place is clean it will discourage the people from dumping rubbish or faeces into the environment</i>	Improve on community planning to promote pro-environment behaviour
10Py14	<i>There is the need to organize the youth to clean the community and also to discourage people from littering--14</i>	Involve youth in interventions
10Pw1	<i>change behaviour, I think that individuals should carry the rubbish to the container themselves instead of giving them to the "Junkers</i>	Community members to avoid services of informal collectors
10Pw2	<i>should be more rubbish containers and must be emptied regularly</i>	Ensure efficient collection solid waste
10Pw3	<i>Poverty is also responsible for the inability of people to afford sanitation services</i>	Factor people who cannot afford services in plan
10Pm1	<i>The reason why people behave this ways is that there is no one who summons offenders</i>	Polluters not summoned
10Pm2	<i>Everybody does what he or she want</i>	Lack of control over community behaviour and actions
10Pm3	<i>Once you talk about it they tell you this is not where you sleep</i>	Uncooperative and hostile attitude of polluters
10Pm4	<i>We also think that poverty is a contributing factor</i>	Factor those who cannot afford
10Pm5	<i>Junkers take more money than when rubbish is sent to the containers but because some people do not want to carry or send their children with the rubbish they engage the services of the Junkers</i>	Control activities of informal collectors because they offer some useful services
10Pm6	<i>The community Elders or leaders are silent for fear of being insulted or even attacked but we are convinced that once you talk to them [as coming from government or working in collaboration with government] they will listen</i>	Community leaders to be courageous
10Pm7	<i>To let people change their behaviour we need a watchdog committee in the community to oversee the place for waste disposal-</i>	Set up a watchdog committee
10Pm8	<i>will help in controlling the sanitation problem in the community</i>	Role of watch dog committee in pollution control
10Pm9	<i>If invited, they [the youth] will come but the starting is important"</i>	Youth will to participate in pollution control
10Pm10	<i>If invited, they [the youth] will come but the starting is important"</i>	-
10Pm11	<i>Education alone may not cause behavioural change unless people are arrested and prosecuted or fined or something</i>	Educate and create awareness Enforce the laws on sanitation and environmental pollution control
10Pm12	<i>Individuals in the community are very stubborn</i>	Address lawless in the community
10Pm13	<i>They do not listen to their parents</i>	Address lawlessness
10Pm14	<i>We need the AMA Town Council people to arrest and fine or the courts to jail offenders". If you talk about it you will be insulted</i>	The city should enforce laws

ID	Key point	Code
10Pm15	<i>Attempts to cause people to change their behaviour should therefore be done in cooperation with the police”</i>	Enforce the laws on sanitation and environmental pollution
10Pm16	<i>Help us set up an association to help, if it is the government or an NGO, they may listen</i>	Set up community watchdog committee
10Pm17	<i>There are some sections of the community which are total disorder areas where there are some disabled people in association with able people doing all sorts of evil</i>	Address lawlessness
10Pm18	<i>”. “Change can take place religiously or through the police</i>	Apply principles of faith Enforce the laws
10Pm19	<i>On how behaviour has been changed in the past, we will say that there was a time that we had some chieftaincy disputes but this was resolved through arbitration-</i>	Employ dialogue

Concepts

Statement	ID
Promoting community participation in water and environmental management	9Pc1,9Pc2,9Pc3,9Pc4,9Pc5,9Pc8,9Pc9,9Pc10,9Pc11,9Py1,9Py2,9Py4,9Py9,9Py14,9Pm3,9Pm6,9Pm7,9Pm8,9Pm9,9Pm12,9Pm13,9Pm16,9Pm17,9Pc11,9Pm3,9Pm2[lawlessness],9Pm1
Educating and creating awareness for water and environmental pollution control among community members	9Pc6,9Pc7,9Pc8,9Pc9,9Pc10,9Pm11,9Pm18
Promoting efficient and user friendly formal and informal solid waste collection	9Pc7,9Py10,9Pw1,9Pw2,9Pw3,9Pm4
Responding to perceptions, behaviour, attitudes and practices leading to water and environmental pollution control	9Pc11,9Py5,
Designing , constructing and maintaining drainage networks to control local flooding	9Py11
Active city participation in the enforcement of laws on sanitation and environmental pollution control	9Py12,,9Pm1,9Pm11,9Pm14,9Pm15,9Pm18
Improving on the state of community infrastructure planning to promote pro-environmental behaviour	9Py13

Perception of wealth

ID	Key point	Code
10Pc1	<i>Good living is having money, no much problem, no quarrels with people, correct water [clean water], eating good food, conducive environment for good health, good sanitation, dressing neatly, health, education, three square meals a day, good accommodation, good relationship with other</i>	Financial position Demonstrate good behaviour towards neighbours Ability to cater for household needs Demonstrate environmental awareness and personal cleanliness Access to shelter
10Pc2	<i>Wealthy means one has the ability to satisfy basic needs</i>	Ability to cater for basic needs
10Pc3	<i>The wealthy are financially alright, possess cars, have good homes, help people with money, and give the children quality education</i>	Financial position Possession of car Possession of shelter Charitable to society
10Py1	<i>One who is in good health, neat. You can drink and eat in the person's house. The house is clean. The person is educated, own houses, happy with life, smells good. He/she eats at good places</i>	Demonstrate environmental awareness and personal cleanliness Educated Possess dwelling unit
10Py2	<i>Living in wealth means you have money, can afford meals, speaks the truth, speaks with patience, understanding. He/she helps when an issues comes to him/her</i>	Financial position Ability to cater for household needs Sincere Speaks well and with patience Understanding, Patriotic
10Py3	<i>They share, food, clothing, and money. The wealthy have good living, own car(s), have money, own houses, and educate</i>	Financial position Ability to cater for household needs Ownership of car Ownership of dwelling unit Educated
10Pw1	<i>Good living is one who is healthy, has good sleep, is free, can afford services, can access all sanitation facilities</i>	Ability to cater for household needs
10Pw2	<i>One, who is living in wealth dresses well, can eat as many times as possible, has a car, nothing worries him/her, and food is in abundance</i>	Good appearance Ability to afford household needs Possession of a car
10Pm1	<i>One in good living has a job, no problem, satisfied with salary, has money, nothing worries him or her, able to afford three meals a day without any problem, has good apartment, sponsor's children's education</i>	Gainful employment or income generating activity Ability to afford household needs
10Pm2	<i>Material wealth includes houses, cows, farms, company-</i>	Possession of dwelling unit Possession of livestock Possess of farms Own income generating activity
10Pm3	<i>Having your job, good health, have everything, and employing others</i>	Own income generating activity Ability to afford household needs
10Pm4	<i>The wealthy are identified by their investment, houses, companies, people living with him/her, the appearance of the person and the family</i>	Investments Possession of dwelling units Own income generating activity appearance

Concepts

Concept	ID
Financial position and ability to cater for household basic needs	9Pc1,9Pc2,9Pc3,9Py2,9Py3,9Pw1,9Pw2,9Pm1,9Pm3 9Pm14
Demonstrating good relationship with neighbours and supporting community initiatives and individuals	9Pc1,9Pc3,9Py2
Demonstrating environmental and personal cleanliness	9Pc1,9Py1,9Pm4
Ownership of dwelling unit or ability to afford household rent	9Pc1,9Pc3,9Py1,9Py3,9Pm2,9Pm4
Ownership of a means of transport	9Pc3,9Py3
Solution oriented judgment promoting productivity	9Py2
Access to job in the formal and informal sector as well as other income generating activities	9Pm1,9Pm2,9Pm3,9Pm4
Ownership of livestock and farms	9Pm2
Charitable to society	10Pc3

Perception of Poverty

ID	Key point	Code
10Pc1	<i>One in bad living lacks good drinking water, is hungry, has no money, and is unable to meet basic needs such as food, accommodation, sanitation, illiteracy-</i>	Inability to afford household basic needs Low financial position Lack of dwelling unit
10Pc2	<i>Poverty means one cannot meet basic needs, has no money, lacks basic understanding to certain things, for example littering which may contribute to mosquito breeding, lack of knowledge</i>	Inability to afford basic household needs Low financial position Lacks basic understanding on the environment
10Pc3	<i>What has trapped people in poverty include ; lack of education , lack of good jobs, lack of planning in households, lack of household financial planning, fashion where people spend the little they have on dresses, unemployment, lack of appropriate skill for the respective jobs</i>	Trappings: Lack of education, lack of good jobs Lack of planning of households Lack of appropriate skills
10Pc4	<i>Poor people in the community cope in several ways and these include depending on relations, stealing, subjecting themselves to the weather hazards (sleeping in the open), reduce the frequency and the quality of food, and do a lot of walking to save money</i>	Cope: Dependency on families Indulging in social vices Reducing the frequency and quality of basic household needs
10Py1	<i>One who is in bad living has the house full of rubbish, is dirty, always sick, and does not eat good food. Bath once a day in the night</i>	Does not demonstrate environmental awareness and personal cleanliness
10Py2	<i>Living in poverty has low purchasing power, cannot buy meat when he/she buys meals, there is lack of food, no money for preparing soup, cannot pay to access sanitation services, has no money for business</i>	Low financial position Inability to afford household basic needs

ID	Key point	Code
10Py3	<i>The poor are identified by their clothing, begging, sanitation, walking, face, the smell on them</i>	Appearance
10Py4	<i>What has trapped people in poverty include lack of jobs, lack of parental support though the individual may be academically brilliant. Some are due to laziness to work</i>	Trappings: Lack gainful employment or income generating activities Lack of parental support laziness
10Py5	<i>Some people are as a result of squandering their school fees</i>	truancy
10Pw1	<i>One who is in bad living finds it difficult to access water and sanitation services, has no food, no sleep, lacks parental care, under peer pressure, no sleeping place, cannot afford rent, cannot afford to buy dress, foot wear</i>	Inability to afford household basic needs Lack of parental care Negative peer influence Lacks the ability to pay for dwelling unit
10Pm1	<i>One in bad living cannot afford 3 square meals, sleeps in poor places e.g. mosque</i>	Inability to afford household basic needs Struggles to afford cost decent shelter
10Pm2	<i>To live in poverty means being needy, having no job, unable to afford food, not neat, thinking all the time, having a bad living, unable to pay for accommodation, -sleep in kiosk, mosque, cannot afford a meal a day-</i>	Lack of employment Inability to afford household basic needs Struggle to pay for cost of rent of dwelling unit
10Pm3	<i>The dressing of the poor shows, when they approach you for help</i>	

Concepts

Statement	ID
Low financial position and inability to cater for household basic needs	9Pc1,9Pc2,9Py2,9Pw1,9Pm1,9Pm2,9Pc3,9Pc4,[cope]
Lack of ownership of dwelling unit or ability to afford cost of rent for dwelling unit	9Pc1,9Pm2,9Pm1
Lack of environmental and personal cleanliness	9Pc2,9Py1,9Py3
What traps in poverty include lack of employment and other income generating activities	9Pc3,9Py4,9Pm2
What traps in poverty include level of education and skill development	9Pc3
Dependency on friends and family as coping strategy	9Pc4
Lack of judgment and result oriented decision making process leading to unproductively	9Py4,9Py5,9Pw1
Lack of parental care	9Pw1
Indulgence in social vices as coping strategy	9Pc4

APPENDIX 3.8: PRINCIPAL COMPONENT ANALYSIS

Principal Component Analysis (PCA) is a ‘data reduction ‘procedure. It is useful when data have been obtained on a number of variables (possibly a large number of variables), and it is believed that there is some redundancy in those variables. In this case, redundancy means that some of the variables are correlated with one another. Thus it should be possible to reduce the observed variables into a smaller number of principal components (weights) that will account for most of the variance [differences] in the observed variables (http://en.wikipedia.org/wiki/Principal_component_analysis).

Technically, a **principal component** can be defined as a linear combination of optimally-weighted observed variables. The words “linear combination” refers to the fact that scores on a component [set of weights] are created by adding together scores on the observed variables being analyzed. “Optimally weighted” refers to the fact that the observed variables are weighted in such a way that the resulting components [weights] account for a maximal amount of variance [differences] in the data set. (<http://www.statsoft.com/textbook/principal-components-factor-analysis/?button=1>; <http://support.sas.com/publishing/pubcat/chaps/55129.pdf>).

Thus the first component [first set of weights accounting for differences in the data set or between households in this instance] extracted in a principal component analysis accounts for a maximal amount of total variance [difference] in the observed variables. Under typical conditions, this means that the first component [first set of weights] will account for most of the differences between the observed variable. The second component [set of weights] extracted will have two important characteristics. First, these weights will account for a maximal amount of differences in the data set that was not accounted for by the first set of weights. The second characteristic of the second component [set of weights] is that it will be *uncorrelated* with the first component [first set of weight]. Literally, if one were to compute the correlation between components 1 and 2, that correlation would be zero. The remaining components [set of weights] that are extracted in the analysis display the same two characteristics: each account for a maximal amount of differences in the observed variables that was not accounted for by the preceding components, and is uncorrelated with all of the preceding components. A principal component analysis proceeds in this fashion, with each new component[set of weights] accounting for progressively smaller and smaller amounts of variance [differences] (this is why only the first few components are usually retained and interpreted). The observed variables are standardized in the course of the analysis. This implies that each variable is transformed so that it has a mean of zero and a variance of one. The “total variance” in the data set is simply the sum of the variances of these observed variables. Thus each variable contributes one unit of variance to the “total variance” in the data set. As a result of this, the total variance in a principal component analysis will always be equal to the number of observed variables being analyzed. (<http://support.sas.com/publishing/pubcat/chaps/55129.pdf>).

Some practical application and interpretation of PCA

The PCA works best when asset variables are correlated, but also when the distribution of variables varies across cases, or in these instance households. It is the assets that help differentiate between households that are given more weight (McKenzie, 2003). Variables with low standard deviation will carry a low weight from the PCA; for example an asset which all households own or which no household own (ie zero standard deviation) would exhibit no variation between households and would be zero weighted and so of little use in differentiating socio-economic status (SES) (Vyas and Kumanayake, 2006).

The number of principal components [set of weights accounting for differences in the data set] extracted can also be defined by the user. However, it is assumed that the first principal component [set of weights] is a measure of economic status (Houweling *et al.*, 2003). McKenzie (2003) considered the use of additional principal components in characterizing households SES, investigating whether they related to non-durable consumption, and concluded that only the first principal component was necessary for measuring wealth. Filmer and Pritchett (2001) also considered the use of additional components in their analysis.

The output of PCA is a table of scores or weights for each variable. In general a variable with a positive weight is associated with a higher SES, and conversely a variable with a negative weight is associated with lower SES. This means that all things being equal, that a household with an asset of a negative score will be ranked lower in terms of SES than a household without such an asset. The reason for such a result may be ownership of assets with negative score being more strongly correlated with variables that are expected to be associated with lower SES (Vyas and Kumanayake, 2006).

Using the first principal component [weights], a dependent variable can then be constructed for each household (Y) [Socio-economic score] which has a mean equal to zero and a standard deviation equal to one. This dependent variable can be regarded as the 'socio-economic' score, and the higher the household socio-economic score, the higher the implied SES [Socio-economic Status] of that household. The issue of adjusting for household size was raised by McKenzie (2003). As is the case for the study by Filmer and Pritchett (2001), McKenzie (2003) does not adjust for household size, arguing the benefits of indicators used are available at the household level.

According to Vyas and Kumanayake, (2006), debate about PCA reflects the fact that principal components are artificially constructed indices [weights]. Critics of PCA argue that the technique is arbitrary, that the method of choosing the number of components [set of weights differentiating variables in the data set] and the variable to include is not well-defined. The empirical basis of the technique rests on whether the first principal component can predict SES. This is entirely dependent on the nature of the data and the relationships between variables that are being considered; the validity of the variables being considered and their reliability.

However, the aim of using PCA to generate a wealth index is to define a single indicator of SES, and using multiple principal components will not be compatible with this (Howe *et al.*, (2008). If the first principal component [set of weights] explains a small proportion of the total variance [difference in the data set], each higher order component will explain a smaller proportion still, so using two or three principal components may not drastically improve the proportion of the total variance explained (Howe *et al.*, 2008). In this particular study, the first and second PCA [set of weights] were found to be relevant and therefore used to compute the socio-economic score of each household. This was followed with mean socio-economic scores for the respective selected communities. The results are presented in chapter four.

APPENDIX 4.1: PRESENCE OF TAP WATER

Community	Frequency in parenthesis		
	Yes	No	Total[N]
Abokobi-Pantang	5(2)	95(38)	100(40)
Agbogba	40.5(17)	59.5(25)	100(42)
Abelempke	82.1(32)	17.9(7)	100(39)
Dzorwulu	75(30)	25(10)	100(40)
Kokomlemle	72.1(31)	27.9(12)	100(43)
Nima	45.7(32)	54.3(38)	100(70)
Alajo	59.5(25)	40.5(17)	100(42)
Abofu	70.5(31)	29.5(13)	100(44)
North Industrial Area	27.5(11)	72.5(29)	100(40)
Sabon Zongo	48.8(21)	51.2(22)	100(43)
Total sample	52.4(232)	47.6(211)	100(443)

APPENDIX 4.2: SOURCES OF TAP WATER FOR HOUSEHOLDS WITHOUT CONNECTION

Category of community	Neighbour's connection	Small – scale water vendor	Water sold from polytank [plastic tank]	Water tanker	Others	Total[N]
Peri-urban	27 (17)	20.6 (13)	19 (12)	9.5 (6)	23.8 (15)	100(63)
High infrastructure provision	46.2(12)	50 (13)	-	-	3.8 (1)	100 (26)
Medium-infrastructure provision	73.2(41)	26.8 (15)	-	-	-	100 (56)
Low infrastructure provision	57.6 (34)	39(23)	-	-	3.4 (2)	100 (59)
Total sample	54(104)	31.4(64)	5.9(12)	2.9(6)	8.8(18)	100(204)

APPENDIX 4.3: MODE OF STORING WATER

Category of community	Buckets	Gallons	Drums	Overhead tanks	>1 mode	Others	Total [response]
Peri-urban	7.6(6)	32.9 (26)	39.2(31)	15.2 (12)	5.1 (4)	-	100(79)
High infrastructure provision	4.3(5)	34.2(40)	42.7(50)	13.7(16)	3.4(4)	1.7(2)	100(117)
Medium infrastructure provision	4.5(5)	27(30)	53.2(59)	9.9(11)	4.5(5)	0.9(1)	100(111)
Low infrastructure provision	5.6(7)	27(34)	52.4(66)	7.1(9)	3.2(4)	4.8(6)	100(126)
Total sample	5.3(23)	30(130)	47.6(206)	11.1(48)	3.9(17)	2.1(9)	100(433)

APPENDIX 4.4: COMMUNITY PERCEPTION OF REGULARITY OF TAP WATER

Community	Flows for most part of the month	Flows for 3 weeks in a month	Flows for 2 weeks in a month	Flows for a week in a month	Flows for less than a week in a month	Other	Total [N]
Abokobi-Pantang	89.5 (34)	2.6(1)	2.6(1)	-	5.3 (2)	-	100(38)
Agbogba	58.1(18)	-	12.9(4)	9.7(3)	19.4(6)	-	100(31)
Abelemkpe	37.1(13)	2.9(1)	14.3(5)	14.3(5)	22.9(8)	8.6(3)	100(35)
Dzorwulu	86.8(33)	-	-	5.3(2)	7.9(3)	-	100(38)
Kokomlemlle	55(22)	12.5(5)	15(6)	5(2)	10(4)	2.5(1)	100(40)
Nima	72.1(49)	4.4(3)	11.8(8)	-	8.8(6)	2.9(2)	100(68)
Alajo	65(26)	2.5(1)	7.5(3)	2.5(1)	22.5(9)	-	100(40)
Abofu	46.2 (18)	10.3(4)	15.4(6)	12.8(5)	10.3(4)	5.1(2)	100(39)
North Industrial Area	73(27)	2.7(1)	2.7(1)	-	21.6(8)	-	100(37)
Sabon Zongo	64.3(27)	-	4.8(2)	4.8(2)	26.2(11)	-	100(42)
Total sample surveyed	65.4(267)	3.9(16)	8.8(36)	4.9(20)	15(61)	2(8)	100(408)

APPENDIX 4.5: NATURE OF WATER QUALITY PROBLEM

Category of community	Presence of impurities	Water is saline	Presence of algae	Other	N
Peri-urban	57.8 (26)	37.8 (17)	4.4(2)	-	100(45)
High infrastructure provision	79(49)	14.5(9)	-	6.5(4)	100(62)
Medium infrastructure provision	89.3 (25)	3.6(1)	3.6(1)	3.6(1)	100(28)
Low infrastructure provision	89.6(43)	2.1(1)	4.2(2)	4.2(2)	100(48)
Total response	78.1(143)	15.3(28)	2.7(5)	3.8(7)	100(183)

APPENDIX 4.6: FREQUENCY OF HOUSEHOLDS' ACCESS TO WATER AT PURC RATE AND PRIVATE CHARGE

Rate of domestic water * category of community Cross tabulation					
	Income group				Total
	Peri-urban	High infrastructure provision	Middle infrastructure provision	Low infrastructure provision	
PURC	12.7% (10)	64.1%(75)	28.3%(30)	18.1%(21)	32.5%(136)
Private vendors	87.3%(69)	35.9%(42)	71.7%(76)	81.9%(95)	67.5%(282)
Total	100.0%(79)	100.0%(117)	100.0%(106)	100.0%(116)	100.0%(418)

APPENDIX 4.7: COMPLAINTS ABOUT COST OF WATER

(χ^2 , 3df=7.9, p=0.048)

Category of community		Gender of Household head		Total
		Men	women	
Peri-urban	Yes	30.1(22)	28.6(2)	30(24)
	No	69.9(51)	71.4(5)	70(56)
	Total	100(73)	100(7)	100(80)
High access to infrastructure provision	Yes	34.1(30)	29.2(7)	33(37)
	No	65.9(58)	70.8(17)	67(75)
	Total	100(85)	100(24)	100(112)
Medium access to infrastructure provision	Yes	15.3(13)	23.8(5)	17(18)
	No	84.7(72)	76.2(16)	83(88)
	Total	100(85)	100(21)	100(106)
Low access to infrastructure provision	Yes	28.4(21)	22.5(9)	26.3(30)
	No	71.6(53)	77.5(31)	73.7(84)
	Total	100(74)	100(40)	100(114)
Overall	Yes	26.9 (86)	25(23)	26.5(109)
	No	73.1(234)	75(69)	73.5(303)
	Total	100(320)	100(92)	100(412)

APPENDIX 4.8: NATURE OF HOUSE OR DWELLING UNIT

Nature of dwelling unit	Abokobi - Pantang (P)	Agboba (P)	Abele mkpe (H)	Dzorwulu (H)	Kokomleml e (H)	Nima(M)	Alajo(M)	Abofu (L)	North Industrial Area (L)	Sabon Zongo (L)
A[single room]	35 (14)	16.7 (7)	10.6 (4)	25 (10)	39.5 (17)	60 (42)	32.4 (12)	25 (11)	52.5 (21)	34.6 (14)
B [double self contained]	12.5 (5)	61.9 (26)	21 (8)	22.5 (9)	16.3 (7)	18.6 (13)	13.5 (5)	27.3 (12)	12.5 (5)	11.7 (5)
C[double compound room]	30 (12)	2.4 (1)	28.9 (11)	30 (12)	23.3 (10)	1.4 (1)	48.6 (18)	20.5 (9)	25 (10)	51.2 (22)
D [three or more rooms]	17.5 (7)	16.7 (7)	39.5 (15)	22.5 (9)	18.6 (8)	2.9 (2)	5.4 (2)	18.5 (8)	5 (2)	2.3 (1)
E[Others]	5 (2)	2.4 (1)	-		2.3 (1)			9.1 (4)	5 (2)	2.3 (1)
Total	100 (40)	100 (42)	100 (38)	100 (40)	100 (43)	100 (70)	100 (37)	100 (44)	100 (40)	100 (43)

APPENDIX 4.9: PERCENTAGE MONTHLY INCOME SPENT ON DOMESTIC WATER

Category of community		Percentage expenditure								Total
		<1	1-4.9	5-9.9	10-14.9	15-19.9	20-24.9	25-29.9	≥30	
Peri-urban	Men	-	60.6 (40)	24.2 (16)	15.2 (10)	-	-	-	-	100 (66)
	Women	-	42.9 (3)	28.6 (2)	-	14.3 (1)	-	-14.3 (1)	-	100 (7)
	Total	-	58.9 (43)	24.7 (18)	13.7 (10)	1.4 (1)	-	1.4 (1)	-	100 (73)
High infrastructure provision	Men	22.2 (20)	54.4 (49)	15.6 (14)	5.6 (5)	2.2 (2)	-	-	-	100 (90)
	Women	19.2 (5)	57.7 (15)	11.5 (3)	-	7.7(2)	3.8 (1)	-	-	100 (26)
	Total	21.6 (25)	55.2 (64)	14.7 (17)	4.3(5)	3.4(4)	0.9 (1)	-	-	100 (116)
Medium infrastructure provision	Men	9.5 (8)	63.1 (53)	25 (21)	2.4 (2)	-	-	-	-	100 (84)
	Women	5 (1)	45 (9)	30 (6)	15 (3)	5 (1)	-	-	-	100 (20)
	Total	8.7 (9)	59.6 (62)	26 (27)	4.8(5)	1 (1)	-	-	-	100 (104)
Low infrastructure provision	Men	5.5(4)	75.3(55)	8.2(6)	8.2(6)	-	-	1.4(1)	1.4(1)	100 (73)
	Women	-	65 (26)	15(6)	12.5 (5)	-	2.5 (1)	-	5 (2)	100 (40)
	Total	3.5 (4)	71.7 (81)	10.6 (12)	9.7 (11)	-	0.9 (1)	0.9 (1)	2.7 (3)	100 (113)
Overall	Man	10.2 (32)	62.9 (197)	18.2 (57)	7.3 (23)	0.6 (2)	-	0.3 (1)	0.3 (1)	100 (313)
	Woman	6.5(6)	57 (53)	18.3 (17)	8.6 (8)	4.3 (4)	2.2 (2)	1.1 (1)	2.2 (2)	100 (93)
	Total	9.4 (38)	61.6 (250)	18.2 (74)	7.6 (31)	1.5 (6)	0.5(2)	0.5 (2)	0.7 (3)	100 (406)

APPENDIX 4.10: MEAN MONTHLY EXPENDITURE ON TREATED WATER FOR DOMESTIC ACTIVITIES [CATEGORY LEVEL]; COMPARISON WITHIN GENDER

Income group	Gender of HH head	Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
Peri-urban	Man	PURC	8.9444	9	3.79510	1.26503
		Private vendors	16.9655	58	16.38700	2.15172
		Total	15.8881	67	15.53242	1.89759
	Woman	PURC	12.0000	1	.	.
		Private vendors	6.3750	6	2.40702	.98266
		Total	7.1786	7	3.05748	1.15562
High infrastructure provision	Man	PURC	7.8600	62	5.01132	.63644
		Private vendors	12.0192	26	7.58351	1.48725
		Total	9.0889	88	6.14625	.65519
	Woman	PURC	5.4818	11	3.23321	.97485
		Private vendors	9.6125	16	7.60543	1.90136
		Total	7.9296	27	6.45516	1.24230
Middle infrastructure provision	Man	PURC	9.6739	23	6.58443	1.37295
		Private vendors	12.7429	63	8.40485	1.05891
		Total	11.9221	86	8.03834	.86680
	Woman	PURC	7.6786	7	5.88202	2.22320
		Private vendors	8.3077	13	5.86138	1.62565
		Total	8.0875	20	5.72004	1.27904
Low infrastructure provision	Man	PURC	6.4167	12	4.02737	1.16260
		Private vendors	11.0820	61	7.16541	.91744
		Total	10.3151	73	6.94947	.81337
	Woman	PURC	4.0333	9	2.57585	.85862
		Private vendors	12.0879	33	8.11337	1.41236
		Total	10.3619	42	7.99130	1.23309

**APPENDIX 4. 11: MONTHLY EXPENDITURE ON DOMESTIC WATER
ANOVA: COMPARISON BETWEEN MALE AND FEMALE HEADED
HOUSEHOLDS**

Category of community	Rate/charge for domestic water		Sum of squares	df	Mean square	F	Sig.
Peri-urban	PURC	Between Groups	8.403	1	8.403	0.583	0.467
		Within Groups	115.222	8	14.403		
		Total	123.625	9			
	Private	Between Groups	609.865	1	609.865	2.466	0.121
		Within Groups	15335.400	62	247.345		
		Total	15945.265	63			
High infrastructure provision	PURC	Between Groups	52.839	1	52.839	2.292	0.134
		Within Groups	1636.448	71	23.049		
		Total	1689.286	72			
	Private	Between Groups	57.372	1	57.372	0.995	0.324
		Within Groups	2305.378	40	57.634		
		Total	2362.750	41			
Medium infrastructure provision	PURC	Between Groups	21.367	1	21.367	0.515	0.479
		Within Groups	1161.394	28	41.478		
		Total	1182.760	29			
	Private	Between Groups	211.978	1	211.978	3.273	0.074
		Within Groups	4792.044	74	64.757		
		Total	5004.021	75			
Low infrastructure provision	PURC	Between Groups	29.213	1	29.213	2.398	0.138
		Within Groups	231.497	19	12.184		
		Total	260.710	20			
	Private	Between Groups	21.669	1	21.669	0.384	0.537
		Within Groups	5187.045	92	56.381		
		Total	5208.714	93			

OVERALL MEAN MONTHLY EXPENDITURE ON TREATED WATER FOR DOMESTIC ACTIVITIES [BY GENDER]

Gender of HH head	Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
Man	PURC	8.1823	106	5.23687	.50865
	Private vendors	13.3428	208	11.06541	.76725
	Total	11.6007	314	9.80567	.55337
Woman	PURC	5.7982	28	4.11660	.77796
	Private vendors	10.2787	68	7.40349	.89781
	Total	8.9719	96	6.90391	.70463

APPENDIX 4.12: MEAN MONTHLY EXPENDITURE ON TREATED WATER FOR DOMESTIC ACTIVITIES BY HOUSEHOLDS OBTAINING WATER AT PURC RATES AND PRIVATE CHARGES [at the community level]

Location of Respondent	Rate of domestic water	Mean/ GH¢	N	Std. Deviation
Abokobi/Pantang (P)	PURC	6.2500	2	1.76777
	Private vendors	12.2868	34	8.29433
	Total	11.9514	36	8.18051
Agbogba (P)	PURC	10.0000	8	3.74166
	Private vendors	20.1500	30	20.91821
	Total	18.0132	38	19.05770
Abelemkpe (M)	PURC	7.7662	29	6.05549
	Private vendors	13.1000	10	9.65459
	Total	9.1338	39	7.39341
Dzorwulu (H)	PURC	7.8533	30	4.06632
	Private vendors	15.2556	9	8.02108
	Total	9.5615	39	6.01216
Kokomlemle (H)	PURC	6.2000	14	3.43713
	Private vendors	8.6087	23	5.52259
	Total	7.6973	37	4.93021
Nima (M)	PURC	9.1324	17	5.69136
	Private vendors	12.2146	48	8.08674
	Total	11.4085	65	7.61486
Alajo(M)	PURC	9.3077	13	7.44015
	Private vendors	11.5893	28	8.44048
	Total	10.8659	41	8.11482
Abofu(L)	PURC	4.8455	11	3.32005
	Private vendors	14.8167	30	9.99524
	Total	12.1415	41	9.75669

Avenor/North Industrial(L)	PURC	3.5000	5	1.58114
	Private vendors	8.5000	32	4.28237
	Total	7.8243	37	4.36720
Sabon Zongo(L)	PURC	8.5000	5	4.21307
	Private vendors	11.2000	32	6.01739
	Total	10.8351	37	5.83334

APPENDIX 4.13: MEAN PER CAPITA PER DAY CONSUMPTION OF WATER FOR DOMESTIC ACTIVITIES [COMMUNITY LEVEL]

Location of Respondent	Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
Abokobi/Pantang (P)	PURC	117.09	2	46.55	32.91
	Private vendors	31.20	34	18.59	3.18
	Total	35.97	36	28.03	4.67
Agbogba (P)	PURC	203.09	8	73.47	25.98
	Private vendors	38.06	30	30.43	5.56
	Total	72.81	38	79.98	12.97
Abelemkpe (H)	PURC	164.50	29	82.07	15.24
	Private vendors	39.27	10	22.90	7.24
	Total	132.39	39	90.31	14.46
Dzorwulu (H)	PURC	164.72	29	61.93	12.12
	Private vendors	51.93	9	43.86	14.62
	Total	138.01	38	75.36	12.22
Kokomlemle (H)	PURC	138.32	14	69.42	18.55350
	Private vendors	25.77	23	10.72	2.24
	Total	68.36	37	69.80	11.48
Nima (M)	PURC	184.15	17	74.81	18.14
	Private vendors	29.49	48	14.60	2.11
	Total	69.94	65	79.04	9.80
Alajo (M)	PURC	122.26	13	74.73	20.73
	Private vendors	27.69	28	11.70	2.21
	Total	57.67	41	61.26	9.57
Abofu (L)	PURC	102.60	11	40.29	12.15
	Private vendors	39.78	30	20.46	3.74
	Total	56.63	41	38.77	6.06
Avenor/North Industrial (L)	PURC	64.37	5	48.66	21.76
	Private vendors	26.76	32	16.88	2.98
	Total	31.85	37	26.05	4.28
Sabon Zongo (L)	PURC	112.36	5	56.92	25.45
	Private vendors	27.67	32	12.52	2.21
	Total	39.11	37	36.84	6.06
Total sample	PURC	151	133	74.4	6.45
	Private	31.8	276	20.1	1.21

ANALYSIS OF VARIANCE FOR MEAN PER CAPITA PER DAY CONSUMPTION OF DOMESTIC WATER AT THE COMMUNITY LEVEL [PURC AND PRIVATE COMPARED]

ANOVA Table							
Location of Respondent			Sum of Squares	df	Mean Square	F	Sig.
Abokobi/Pantang	Between Groups	(Combined)	13934.700	1	13934.700	34.926	.000
	Within Groups		13565.161	34	398.975		
	Total		27499.860	35			
Agbogba	Between Groups	(Combined)	172015.438	1	172015.438	95.799	.000
	Within Groups		64641.423	36	1795.595		
	Total		236656.861	37			
Abelemkpe	Between Groups	(Combined)	116612.079	1	116612.079	22.321	.000
	Within Groups		193300.062	37	5224.326		
	Total		309912.141	38			
Dzorwulu	Between Groups	(Combined)	80652.134	1	80652.134	20.833	.000
	Within Groups		143238.849	37	3871.320		
	Total		223890.984	38			
Kokomlemle	Between Groups	(Combined)	110239.073	1	110239.073	59.193	.000
	Within Groups		65182.902	35	1862.369		
	Total		175421.975	36			
Nima	Between Groups	(Combined)	300301.165	1	300301.165	190.018	.000
	Within Groups		99564.202	63	1580.384		
	Total		399865.367	64			
Alajo	Between Groups	(Combined)	79404.312	1	79404.312	43.795	.000
	Within Groups		70709.961	39	1813.076		
	Total		150114.273	40			

Abofu	Between Groups	(Combined)	31763.930	1	31763.930	43.658	.000
	Within Groups		28374.922	39	727.562		
	Total		60138.851	40			
Avenor/North Industrial	Between Groups	(Combined)	6116.016	1	6116.016	11.694	.002
	Within Groups		18305.460	35	523.013		
	Total		24421.476	36			
Sabon Zongo	Between Groups	(Combined)	31023.964	1	31023.964	60.932	.000
	Within Groups		17820.577	35	509.159		
	Total		48844.541	36			

APPENDIX 4.14: MULTIPLE COMPARISON TEST OF SIGNIFICANCE FOR MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER AT THE COMMUNITY LEVEL

WATER USE AT THE PURC RATE

AGBOGBA

In relation to water use at the PURC rate, mean per capita per day use of domestic water at Agbogba was significantly higher than those of Abofu, Kokomlemle, Alajo, and North Industrial Area:

Community	Mean difference	C.I	P-value
Abofu	100.5	35.77 to 165.23	0.003
Kokomlemle	64.8	3.03 to 126.51	0.04
Alajo	80.83	18.24 to 143.43	0.01
North Industrial Area	90.73	11.31 to 170.15	0.025

ABELEMKPE

In relation to water use at the PURC rate, mean per capita per day use of water at Abelemkpe was significantly higher than those of Abofu and North Industrial Area:

Community	Mean difference	C.I	P-value
Abofu	61.9	12.57 to 111.23	0.014
North Industrial Area	100.13	32.67 to 167.58	0.004

DZORWULU

In relation to water use at the PURC rate, the mean per capita per day use of water at the PURC rate at Dzorwulu was significantly higher than those of Abofu, North Industrial Area:

Community	Mean difference	C.I	P-value
Abofu	57.27	8.17 to 106.37	0.02
North Industrial Area	95.5	28.21 to 162.79	0.006

NIMA

In relation to water use at the PURC rate, the mean per capita per day use of water at Nima was significantly higher than those Abofu, Alajo, North Industrial Area, and Sabon Zongo:

Community	Mean difference	C.I	P-value
Abofu	81.55	27.65 to 135.5	0.003
Alajo	61.9	10.56 to 113.22	0.019
North Industrial Area	119.78	48.91 to 190.65	0.001
Sabon Zongo	71.79	0.91 to 142.66	0.047

KOKOMLEMLE

In relation to water use at the PURC rate, the mean per capita per day use of domestic water at Kokomlemle was significantly higher than that of North Industrial Area:

Community	Mean difference	C.I	P-value
North Industrial Area	73.95	1.37 to 146.53	0.046

WATER USE AT PRIVATE CHARGES

AGBOGGBA

In relation to water use at private charge, the mean per capita per day use of water at Agbogba was significantly higher than those of Kokomlemle, Alajo, North Industrial Area, and Sabon Zongo:

Community	Mean difference	C.I	P-value
Kokomlemle	12.29	1.68 to 22.89	0.023
Alajo	10.37	0.32 to 20.43	0.043
North Industrial Area	11.29	1.57 to 21.02	0.023
Sabon Zongo	10.4	0.68 to 20.12	0.036

ABOFU

In relation to water use at private charges, the mean per capita per day use of domestic water at Abofu was significantly higher than those of Nima, Kokomlemle, Alajo, North Industrial Area, and Sabon Zongo:

Community	Mean difference	C.I	P-value
Nima	10.29	1.39 to 19.20	0.024
Kokomlemle	14.00	3.40 to 24.61	0.01
Alajo	12.09	2.04 to 22.14	0.019
North Industrial Area	13.01	3.29 to 22.74	0.009
Sabon Zongo	12.11	2.39 to 21.84	0.015

DZORWULU

In relation to water use at private charges, the mean per capita per day use of water at Dzorwulu was significantly higher than those of Abokobi-Pantang, Nima, Kokmlemle, Alajo, North Industrial Area, and Sabon Zongo:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	20.74	6.40 to 35.08	0.005
Nima	22.45	8.55 to 36.35	0.002
Kokomlemle	26.16	11.12 to 41.20	0.001
Alajo	24.25	9.60 to 38.91	0.001
North Industrial Area	25.17	10.73 to 39.61	0.001
Sabon Zongo	24.27	9.84 to 38.71	0.001

APPENDIX 4.15: MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER AT THE CATEGORY OF COMMUNITY

Income group	Gender of HH head	Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
Peri-urban	Man	PURC	200.5	9	63.69767	21.23256
		Private vendors	34.4106	58	25.94102	3.40622
		Total	56.7274	67	65.81187	8.04020
	Woman	PURC	54.0000	1	.	.
		Private vendors	34.4444	6	11.38940	4.64970
		Total	37.2381	7	12.75657	4.82153
High infrastructure provision	Man	PURC	160.34	62	75.85944	9.63416
		Private vendors	36.4017	26	30.07497	5.89819
		Total	123.7	88	86.77070	9.24979
	Woman	PURC	141.97	11	56.24121	16.95736
		Private vendors	31.6514	16	17.35464	4.33866
		Total	76.5971	27	66.64604	12.82604

Medium infrastructure provision	Man	PURC	168.7	23	80.69658	16.82640
		Private vendors	29.4363	63	14.20776	1.79001
		Total	66.6761	86	75.33923	8.12404
	Woman	PURC	120	7	69.30234	26.19382
		Private vendors	25.8462	13	9.63848	2.67323
		Total	58.8120	20	60.82618	13.60115
Low infrastructure provision	Man	PURC	96.9957	12	51.70058	14.92467
		Private vendors	27.0198	61	12.36784	1.58354
		Total	38.5227	73	34.89681	4.08436
	Woman	PURC	94.2538	9	44.77830	14.92610
		Private vendors	38.9902	33	22.93233	3.99201
		Total	50.8324	42	36.44773	5.62401

ANALYSIS OF VARIANCE: COMPARISON BETWEEN MALE AND FEMALE HEADED HOUSEHOLDS' MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER

Category of community	Rate/charge for domestic water		Sum of squares	df	Mean square	F	Sig.
Peri-urban	PURC	Between Groups	19328.398	1	19328.398	4.764	0.061
		Within Groups	32459.145	8	4057.393		
		Total	51787.543	9			
	Private	Between Groups	0.006	1	.006	0.000	0.997
		Within Groups	39005.969	62	629.129		
		Total	39005.975	63			
High infrastructure provision	PURC	Between Groups	3986.823	1	3986.823	0.770	0.383
		Within Groups	362417.025	70	5177.386		
		Total	366403.848	71			
	Private	Between Groups	223.506	1	223.506	0.330	0.569
		Within Groups	27130.354	40	678.259		
		Total	27353.861	41			
Medium infrastructure provision	PURC	Between Groups	12700.021	1	12700.021	2.066	0.162
		Within Groups	172079.524	28	6145.697		
		Total	184779.545	29			
	Private	Between	138.901	1	138.901	0.754	0.388

		Groups					
		Within Groups	13630.160	74	184.191		
		Total	13769.061	75			
Low infrastructure provision	PURC	Between Groups	38.663	1	38.663	0.016	0.900
		Within Groups	45443.217	19	2391.748		
		Total	45481.881	20			
	Private	Between Groups	3068.549	1	3068.549	10.855	0.001
		Within Groups	26006.347	92	282.678		
		Total	29074.896	93			

APPENDIX 4.16: ANALYSIS OF VARIANCE FOR DIFFERENCE BETWEEN DOMESTIC WATER USE AT THE PURC RATE AND PRIVATE CHARGES AT THE CATGORY LEVEL

Income group	Gender of HH head		Sum of Squares	df	Mean Square	F	Sig.
Peri-urban	Man	Between Groups	215042.814	1	215042.814	197.380	.000
		Within Groups	70816.521	65	1089.485		
		Total	285859.335	66			
	Woman	Between Groups	327.788	1	327.788	2.527	.173
		Within Groups	648.593	5	129.719		
		Total	976.381	6			
High infrastructure provision	Man	Between Groups	281389.882	1	281389.882	64.766	.000
		Within Groups	373646.569	86	4344.728		
		Total	655036.451	87			
	Woman	Between Groups	79335.570	1	79335.570	54.868	.000
		Within Groups	36148.495	25	1445.940		
		Total	115484.065	26			
Middle infrastructure provision	Man	Between Groups	326681.932	1	326681.932	176.156	.000
		Within Groups	155777.997	84	1854.500		
		Total	482459.929	85			
	Woman	Between Groups	40364.980	1	40364.980	24.274	.000
		Within Groups	29931.687	18	1662.872		
		Total	70296.667	19			
Low infrastructure	Man	Between Groups	49100.415	1	49100.415	90.360	.000
		Within	38580.263	71	543.384		

provision		Groups					
		Total	87680.678	72			
	Woman	Between Groups	21596.628	1	21596.628	26.282	.000
		Within Groups	32869.301	40	821.733		
		Total	54465.929	41			

MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER IN THE OVERALL SAMPLE

Gender of HH head	Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
Man	PURC	1.5839E2	106	76.84593	7.46394
	Private vendors	30.9854	208	20.28978	1.40684
	Total	73.9958	314	76.77800	4.33283
Woman	PURC	1.1801E2	28	58.37614	11.03205
	Private vendors	34.3495	68	19.26907	2.33672
	Total	58.7499	96	51.87996	5.29498

ANALYSIS OF VARIANCE FOR MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER IN THE OVERALL SAMPLE [WITHIN GENDER COMPARISON OF WATER USE AT THE PURC RATE AND PRIVATE CHARGES]

Gender of HH head				Sum of Squares	df	Mean Square	F	Sig.
Man	Per capita per day consumption of water *	Between Groups	(Combined)	1139818.679	1	1139818.679	504.235	.000
	Rate of domestic water	Within Groups		705272.940	312	2260.490		
		Total		1845091.619	313			
Woman	Per capita per day consumption of water *	Between Groups	(Combined)	138808.608	1	138808.608	111.629	.000
	Rate of domestic water	Within Groups		116886.792	94	1243.477		
		Total		255695.401	95			

MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER WITHOUT GENDER SEGREGATION IN THE OVERALL SAMPLE

Rate of domestic water	Mean	N	Std. Deviation	Std. Error of Mean
PURC	149.9	134	75.00334	6.47930
Private vendors	31.8142	276	20.06115	1.20754
Total	70.4261	410	71.95958	3.55383

ANALYSIS OF VARIANCE FOR MEAN PER CAPITA PER DAY USE OF DOMESTIC WATER WITHOUT GENDER SEGREGATION IN THE OVERALL SAMPLE

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Per capita per day consumption of water * Rate of domestic water	Between Groups	(Combined)	1259011.075	1	1259011.075	598.087	.000
	Within Groups		858865.309	408	2105.062		
	Total		2117876.384	409			

APPENDIX 4.17: MULTIPLE COMPARISONS WITHIN GENDER AT THE CATEGORY LEVEL

MEN ACCESSING WATER AT THE PURC RATE

1. The mean per capita per day use of domestic water by male headed households accessing water at the PURC rate in the peri-urban communities was significantly higher than that of the male headed households accessing water at the PURC rate in the communities with low infrastructure provision ($P < 0.01$) [mean difference=103.55 ; 95% C.I { 38.97 to 168.13}, $p=0.002$].
2. The mean per capita per day use of domestic water by male headed households accessing water at the PURC rate in the communities with high infrastructure provision was significantly higher than that of male headed households accessing water at the PURC rate in the communities with low infrastructure provision ($P < 0.01$) [mean difference=63.34; 95% C.I { 17.16 to 109.54}, $P=0.008$]
3. The mean per capita per day use of domestic water by male headed households accessing water at the PURC rate in communities with medium infrastructure provision was significantly higher than that of male headed households accessing water at the PURC rate in the communities with low infrastructure provision ($P < 0.01$) [mean difference=71.69; 95% C.I { 19.53 to 123.84} $P=0.008$].

MEN ACCESSING WATER AT PRIVATE CHARGES

1. The mean per capita per day use of domestic water by male headed households accessing water at the private rate in the peri-urban communities was significantly higher than that of the male headed households in communities with low infrastructure provision ($P < 0.05$) [mean difference 7.39; 95% C.I { 0.112 to 14.67}, $P=0.047$]
2. The mean per capita per day use of domestic water by male headed households accessing water at the private rate in communities with high infrastructure provision was significantly higher than that of communities with low infrastructure provision ($P < 0.05$) [mean difference=9.38; 95% C.I { 0.086 to 18.67}, $P=0.048$]

WOMEN ACCESSING WATER AT PRIVATE CHARGES

1. Per capita per day use of domestic water for female headed households obtaining water at the private charge in the category of communities with low infrastructure provision was significantly higher than the category of communities with medium infrastructure provision ($P < 0.05$) [mean difference=13.14; 95% C.I { 0.71 to 25.57}, $P=0.039$]

APPENDIX 4.18: HOUSEHOLD OWNERSHIP OF FLUSH TOILETS

Crosstab				
Category of community	Number of flush toilet in dwelling unit	Rate of domestic water purchase		Total
		PURC	Private vendors	
Peri-urban	0	10.0%(1)	92.8%(64)	82.3%(65)
	1	80.0%(8)	4.3%(3)	13.9%(11)
	2		2.9%(2)	2.5%(2)
	3	10.0%(1)		1.3%(1)
	Total	100.0%(10)	100.0%(69)	100.0%(79)
High infrastructure provision	0	8.2%(6)	38.1%(16)	19.8%(23)
	1	72.6%(53)	57.1%(24)	66.4%(77)
	2	13.7%(10)	2.4%(1)	9.5%(11)
	3	2.7%(2)	2.4%(1)	2.6%(3)
	4	2.7%(2)		1.7%(2)
	Total	100.0%(73)	100.0%(42)	100.0%(116)
Middle infrastructure provision	0	62.1%(18)	88.2%(67)	81.0%(85)
	1	37.9%(11)	11.8%(9)	19.0%(20)
	Total	100.0%(29)	100.0%(76)	100.0%(105)
Low infrastructure provision	0	52.4%(11)	78.9%(75)	74.1%(86)
	1	47.6%(10)	20.0%(19)	25.0%(29)
	2		1.1%(1)	.9%(1)
	Total	100.0%(21)	100.0%(95)	100.0%(116)

APPENDIX 4.19: RESPONSIBILITY FOR FETCHING WATER

Category of community		Responsibility for fetching water						Total
		Mother	Father	Child ren	House help	More than 1	Other	
Peri-urban	Men	23.5 (16)	8.8 (6)	60.3 (41)	1.5 (1)	2.9 (2)	2.9 (2)	100 (68)
	Women	12.5 (1)	-	37.5 (3)	-	12.5 (1)	37.5 (3)	100 (8)
	Total	22.4 (17)	7.9 (6)	57.9 (44)	1.3 (1)	3.9 (3)	6.6 (5)	100 (76)
High infrastructure provision	Men	23.8 (19)	2.5 (2)	56.2 (45)	-	5 (4)	12.5 (10)	100 (80)
	Women	19.2 (5)	-	50 (13)	-	-	30.8 (8)	100 (26)
	Total	22.6 (24)	1.9 (2)	54.7 (58)	-	3.8 (4)	17 (18)	100 (106)
Medium	Men	17.6 (15)	1.2 (1)	70.6 (60)	-	3.5 (3)	7.1 (6)	100 (85)

infrastructure provision	Women	10.5 (2)	-	52.6 (10)	-	-	36.8 (7)	100 (19)
	Total	16.3 (17)	1 (1)	67.3 (70)	-	2.9 (3)	12.5 (13)	100 (104)
Low infrastructure provision	Men	33.8 (25)	4.1 (3)	47.3 (35)	-	1.4 (1)	13.5 (10)	100 (74)
	Women	21.4 (9)	-	57.1 (24)	-	-	21.4 (9)	100 (42)
	Total	29.3 (34)	2.6 (3)	50.9 (59)	-	0.9 (1)	16.4 (19)	100 (116)
Overall	Men	24.4 (75)	3.9 (12)	59 (181)	0.3 (1)	3.3(10)	9.1(28)	100(307)
	Women	17.9(17)	-	52.6 (50)	-	1.1(1)	28.4(27)	100(95)
	Total	22.9(92)	3(12)	57.5(231)	0.2(1)	2.7(11)	13.7(55)	100(402)

APPENDIX 4.20: RESPONSIBILITY FOR PAYING FOR WATER

Category of community		Mother	Father	Children	More than 1	Other	Total
Peri-urban	Men	80.3(57)	9.9(7)	1.4(1)	2.8(2)	5.6(4)	100 (71)
	Women	62.5(5)	-	-	-	37.5(3)	100(8)
	Total	78.5(62)	8.9(7)	1.3(1)	2.5(2)	8.9(7)	100(79)
High infrastructure provision	Men	78.9(71)	8.9(8)	3.3(3)	2.2(2)	6.7(6)	100(90)
	Women	64.3(18)	-	10.7(3)	-	25(7)	100(28)
	Total	75.4(89)	6.8(8)	5.1(6)	1.7(2)	11(13)	100(118)
Medium infrastructure provision	Men	78.7(70)	13.5(12)	2.2(2)	1.1(1)	4.5(4)	100(89)
	Women	47.6(10)	-	9.5(2)	-	42.9(9)	100(21)
	Total	72.7(80)	10.9(12)	3.6(4)	0.9(1)	11.8(13)	100(110)
Low infrastructure provision	Men	46.2(36)	37.2(29)	3.8(3)	2.6(2)	10.3(8)	100(78)
	Women	63.6(28)	-	4.5(2)	4.5(2)	27.3(12)	100(44)
	Total	52.5(64)	23.8(29)	4.1(5)	3.3(4)	16.(20)	100(122)
Overall	Men	71.3(234)	17.1(56)	2.7(9)	2.1(7)	6.7(22)	100(328)
	Women	60.4(61)	-	6.9(7)	2(2)	30.7(30)	100(101)
	Total	68.8(295)	13.1(56)	3.7(16)	2.1(9)	12.4(53)	100(429)

**APPENDIX 4. 21: GENDER OF HOUSEHOLD AND NUMBER OF CHILDREN
CROSS TABULATION**

Category of community		Number of Children					Total
		1-2	3-4	5-6	7-8	9-10	
Peri-urban	Man	88.9% (40)	100.0% (23)	100.0% (3)	100.0% (2)		93.2% (68)
	Woman	11.1% (5)					6.8% (5)
	Total	100.0% (45)	100.0% (23)	100.0% (3)	100.0% (2)		100.0% (73)
High infrastructure provision	Man	84.9% (45)	76.9% (30)	100.0% (4)	66.7% (2)		81.8% (81)
	Woman	15.1% (8)	23.1% (9)	.0%	33.3% (1)		18.2% (18)
	Total	100.0% (53)	100.0% (39)	100.0% (4)	100.0% (3)		100.0% (99)
Medium infrastructure provision	Man	83.3% (55)	80.8% (21)	100.0% (6)		100.0% (1)	83.8% (83)
	Woman	16.7% (11)	19.2% (5)	.0%		.0%	16.2% (16)
	Total	100.0% (66)	100.0% (26)	100.0% (6)		100.0% (1)	100.0% (99)
Low infrastructure provision	Man	62.3% (33)	71.4% (25)	81.8% (9)	100.0% (1)		68.0% (68)
	Woman	37.7% (20)	28.6% (10)	18.2% (2)	.0%		32.0% (32)
	Total	100.0% (53)	100.0% (35)	100.0% (11)	100.0% (1)		100.0% (100)

Gender of HH head * 0-9 years Cross tabulation						
Income group		Number of children within 0-9 years				Total
		1-2	3-4	5-6	7-8	
Peri-urban	Man	94.3% (33)	100.0% (11)	100.0% (2)	100.0% (1)	95.9% (47)
	Woman	5.7% (2)				4.1% (2)
	Total	100.0% (35)	100.0% (11)	100.0% (2)	100.0% (1)	100.0% (49)
High infrastructure	Man	83.3% (30)	75.0% (3)			82.5% (33)

provision	Woman	16.7% (6)	25.0% (1)			17.5% (7)
	Total	100.0% 36	100.0% 4			100.0% 40
Medium infrastructure provision	Man	87.2% (34)	75.0% (30)			86.0% (37)
	Woman	12.8% (5)	25.0% (1)			14.0% (6)
	Total	100.0% (39)	100.0% (4)			100.0% (43)
Low infrastructure provision	Man	63.2% (24)	60.0% (3)			62.8% (27)
	Woman	36.8% (14)	40.0% (2)			37.2% (16)
	Total	100.0% (38)	100.0% (5)			100.0% (43)

APPENDIX 4.22: INCREASE IN COST OF WATER FROM OUTSIDE OF THE COMMUNITY /RESIDENCE [FREQUENCY IN PARENTHESIS] ACCESSED BY HOUSEHOLDS

Community	Yes (%)	No (%)	Total [N]
Abokobi-Pantang	16.2(6)	83.3(31)	37
Agbogba	43.9(18)	56.1(23)	41
Abelemkpe	43.2(16)	56.8(21)	37
Dzorwulu	54.5(18)	45.5(15)	33
Kokomlele	62.2(14)	37.8(23)	37
Nima	24.3(17)	75.7(53)	70
Alajo	46.3(19)	53.6(22)	41
Abofu	61.9(26)	38.1(16)	42
North Industrial Area	51.4(19)	48.6(18)	40
Sabon Zongo	45.2(19)	54.8(23)	42
Overall	43.4(181)	56.6(236)	417

APPENDIX 4.23: HOUSEHOLDS' MONTHLY VOLUME OF WATER USED FOR COMMERCIAL ACTIVITIES

Volume of water used[litres]	Peri-urban	High infrastructure provision	Medium infrastructure provision	Low infrastructure provision	Total
<1000		20.6(7)	10.8(4)	3.8(2)	9.6(13)
1000-4999	61.5(8)	47.1(16)	51.4(19)	69.2(36)	58.1(79)
5000-8999	15.4(2)	14.7(5)	5.4(2)	11.5(6)	11(15)
9000-12999	15.4(2)	8.8(3)	8.1(3)	7.7(4)	8.8(12)
13000-16999	7.7(1)	2.9(1)	2.7(1)	1.9(1)	2.9(4)
17000-20999		2.9(1)	5.4(2)		2.2(3)
25000-28999			2.7(1)		.7(1)
33000-36999		2.9(1)			.7(1)
45000-48999			5.4(2)		1.5(2)
53000-56999			2.7(1)		.7(1)
61000 or more			5.4(2)	5.8(3)	3.7%5
Total	100 (13)	100(34)	100(37)	100 (52)	100 (136)

APPENDIX 4.24: HOUSEHOLDS'S EXPENDITURE ON WATER FOR WATER DEPENDENT OCCUPATIONS

Amount [GH¢]	Peri-urban	High infrastructure provision	Medium infrastructure provision	Low infrastructure provision	Total
1 to 4	10 (1)	38.2 (13)	17.5 (7)	13 (7)	20.3 (28)
5 to 9	40 (4)	26.5 (9)	47.5 (19)	40.7 (22)	39.1 (54)
10 to 14		11.8(4)	2.5 (1)	13 (7)	8.7 (12)
15 to 19	10 (1)	8.8(3)	5 (2)	11.1(6)	8.7 (12)
20 to 24	10 (1)	2.9 (1)	2.5(1)	3.7 (2)	3.6 (5)
30 to 34	10 (1)	2.9(1)	2.5 (1)	5.6 (3)	4.3 (6)
35 to 39	10 (1)	5.9(2)	5 (2)	1.9(1)	4.3 (6)
≥ 40	10 (1)	2.9(1)	17.5 (7)	11.1 (6)	10.9 (15)
	100 (10)	100 (34)	100 (40)	100 (54)	100 (138)

APPENDIX 4.25: PERCENTAGE HOUSEHOLD INCOME INVESTED INTO WATER DEPENDENT OCCUPATIONS

Rate or charge for water * category of community cross tabulation					
Rate or charge for water for income generating activity	Category of community				Total
	Peri-urban	High infrastructure provision	Medium infrastructure provision	Low infrastructure provision	
PURC	7.7% (1)	34.5% (10)	28.2% (11)	16.7%(9)	23.0%(31)
Private charge	92.3% (12)	65.5% (19)	71.8% (28)	83.3% (45)	77.0%(104)
Total	100.0% (13)	100.0% (29)	100.0%(39)	100.0%(54)	100.0%135

APPENDIX 4.26: PERCENTAGE HOUSEHOLD EXPENDITURE ON WATER FOR OCCUPATIONS

Expenditure on water for commercial activities as percentage of total household income	Peri-urban	High infrastructure provision	Medium infrastructure provision	Low infrastructure provision	Total
less than 1		36.4%(12)	10%(4)	5.8%(3)	14.1%(19)
1-4.9	70%(7)	42.4%(14)	45%(18)	61.5%(32)	52.6%(71)
5-9.9	20%(2)	18.2%(6)	25%(10)	21.2%(11)	21.5%(29)
10-14.9	10%(1)		5%(2)	3.8%(2)	3.7%(5)
15-19.9		3.0%(1)			.7%(1)
20-24.9			7.5%(3)		2.2%(3)
25-29.9				3.8%(2)	1.5%(2)
30 or more			7.5%(3)	3.8%(2)	3.7%(5)
Total	100% (10)	100.0%(33)	100%(40)	100.0%(52)	100.0%135

APPENDIX 4. 27: NATURE OF WATER DEPENDENT OCCUPATIONS

Occupations	Peri-urban	High infrastructure provision	Middle infrastructure provision	Low infrastructure provision	Total
Kenkey preparation	6.1%(2)	6.1%(4)	1.6%(1)	3.2%(3)	3.9%(10)
Tea or beverage vending		3.0%(2)	3.2%(2)	2.2%(2)	2.4%(6)

Porridge vending	3.0%(1)	4.5%(3)	6.3%(4)	4.3%(4)	4.7%(12)
Pure water	48.5%(16)	43.9%(29)	44.4%(28)	37.6%(35)	42.4%(108)
Trading and pure water	3.0%(1)				.4%(1)
Other cooked food	9.1%(3)	18.2%(12)	9.5%(6)	17.2%(16)	14.5%(37)
Hair dressing and beauticians	18.2%(6)	15.2%(10)	19.0%(12)	18.3%(17)	17.6%(45)
Water vending	3.0%(1)		1.6%(1)		.8%(2)
Other profession				4.3%(4)	1.6%(4)
Trading	6.1%(2)	1.5%(1)	1.6%(1)	1.1%(1)	2.0%(5)
Pure water and bottled water	3.0%(1)	3.0%(2)			1.2%(3)
Farming		1.5%(1)			.4%(1)
local drink or ice kenkey		1.5%(1)	6.3%(4)	5.4%(5)	3.9%(10)
bottled water		1.5%(1)		1.1%(1)	.8%(2)
Bathroom operating			6.3%(4)	5.4%(5)	3.5%(9)
Total	100%(33)	100%(66)	100%(63)	100%(93)	100%(255)

APPENDIX 4.28: MEAN HOUSEHOLD SIZE AND MEAN TOTAL MONTHLY HOUSEHOLD INCOME

Community	Household size			Total monthly income		
	Mean	SD	SE	Mean	SD	SE
Abokobi-Pantang (P)	4.6 (N=40)	2.13	0.34	322.5 (N=39)	266.54	42.68
Agbogba(P)	4.40 (N=42)	2.16	0.33	438.89 (N=42)	241.46	37.25
Abelemkpe(H)	4.3 (N=39)	2.05	0.33	637 (N=38)	580.78	94.211
Dzorwulu(H)	4.47 (N=40)	1.48	0.23	587 (N=40)	462.94	73.20
Kokomlemle (H)	4.05 (N=43)	2.19	0.33	338.38 (N=43)	222.98	34.00
Nima(M)	4.59 (N=70)	1.86	0.22	354.64 (N=70)	232.65	27.81
Alajo(M)	4.33	2.10	0.32	350.43	260.88	40.742

	(N=42)			(N=41)		
Abofu(L)	4.11 (N=44)	1.82	0.27	463.64 (N=43)	462.07	70.50
North Industrial Area(L)	4.5 (N=40)	2.41	0.38	336.32 (N=39)	231.79	37.11
Sabon Zongo(L)	4.67 (N=43)	2.16	0.33	349.97 (N=41)	179.67	28.06
Total	4.42 (N=443)	2.03	0.10	412.48 (N=436)	343.68	16.46

MEAN HOUSEHOLD INCOME FROM WATER DEPENDENT OCCUPATION

Location of Respondent	Mean	N	Std. Deviation	Std. Error of Mean
Abokobi/Pantang(P)	123.37	13	96.23	26.67
Agbogba(P)	118.38	19	102.81	23.59
Abelemkpe(H)	235.99	25	168.62	33.72
Dzorwulu (H)	259.46	17	231.45	56.13
Kokomlemlle(H)	171.02	25	163.27	32.65
Nima(M)	124.88	39	101.96	16.32
Alajo (M)	131.52	25	101.95	20.40
Abofu (L)	160.18	34	137.28	23.54
Avenor/North Industrial (L)	164.84	28	101.34	19.15
Sabon Zongo (L)	182.88	37	124.58	20.48
Total	165.74	262	138.81	8.57

APPENDIX 4.29: ANALYSIS OF VARIANCE for household size, total monthly income of households and monthly income from water dependent occupation

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
House hold size * Location of Respondent	Between Groups	(Combined)	17.264	9	1.918	.461	.901
	Within Groups		1802.800	433	4.164		
	Total		1820.063	442			
Estimated total net monthly income of HH * Location of Respondent	Between Groups	(Combined)	4606872.423	9	511874.714	4.662	.000
	Within Groups		4.677E7	426	109796.976		
	Total		5.138E7	435			
Net income from water dependent business * Location of Respondent	Between Groups	(Combined)	445681.671	9	49520.186	2.723	.005
	Within Groups		4582963.569	252	18186.363		
	Total		5028645.240	261			

MEAN MONTHLY TOTAL HOUSEHOLD INCOME: MULTIPLE COMPARISONS

MEAN MONTHLY HOUSEHOLD INCOME

ABELEMKPE

The mean monthly household income of Abelemkpe was significantly higher ($P < 0.05$) than those of the following communities:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	314.52	166.07 to 462.98	0.000
Agbogba	198.15	52.33 to 343.96	0.008
Abofu	173.4	28.37 to 318.4	0.019
Nima	282.4	151.2 to 413.63	0.000
Kokomlemlle	298.64	153.64 to 443.7	0.000
Alajo	286.6	139.94 to 433.25	0.000
North Industrial Area	300.71	152.24 to 449.16	0.000
Sabon Zongo	287.06	140.4 to 433.72	0.000

DZORWULU

The mean monthly household income of Dzorwulu was significantly higher ($P < 0.05$) than those of the following communities:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	264.53	117.96 to 411.1	0.000
Agbogba	148.15	4.26 to 292.04	0.044
Nima	232.4	103.31 to 361.5	0.000
Kokomlemle	248.65	105.6 to 391.7	0.001
Alajo	236.59	91.85 to 381.34	0.001
North Industrial Area	250.71	104.14 to 397.3	0.001
Sabon Zongo	237.06	92.31 to 381.8	0.001

MEAN MONTHLY HOUSEHOLD INCOME FROM WATER OCCUPATION: MULTIPLE COMPARISONS

ABELEMKPE

The mean monthly household income from water occupation in Abelemkpe (water income) was significantly higher ($P < 0.05$) than those of the following communities:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	112.62	21.81 to 203.44	0.015
Agbogba	117.61	36.8 to 198.45	0.005
Abofu	75.81	5.84 to 145.8	0.034
Nima	111.11	43.06 to 179.15	0.001
Alajo	104.5	29.4 to 179.6	0.007

DZORWULU

The mean monthly household income from water occupation at Dzorwulu (water income) was significantly higher ($P < 0.05$) than those of the following communities:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	136.1	38.24 to 233.95	0.007
Agbogba	141.1	52.42 to 229.75	0.002
Abofu	99.3	20.4 to 178.2	0.014
Nima	134.6	57.4 to 211.77	0.001
Kokomlemle	88.44	4.95 to 171.94	0.038
Alajo	127.94	44.44 to 211.43	0.003
North Industrial Area	94.6	12.96 to 176.3	0.023

APPENDIX 4.30: ANALYSIS OF VARIANCE FOR HOUSEHOLD SIZE, TOTAL MONTHLY INCOME, AND INCOME FROM WATER OCCUPATION BY GENDER OF HOUSEHOLD HEAD: CATEGORY OF COMMUNITY LEVEL

ANOVA Table								
Income group				Sum of Squares	df	Mean Square	F	Sig.
Peri-urban	House hold size * Gender of HH head	Between Groups	(Combined)	17.059	1	17.059	3.861	.053
		Within Groups		353.429	80	4.418		
		Total		370.488	81			
	Estimated total net monthly income of HH * Gender of HH head	Between Groups	(Combined)	445803.051	1	445803.051	7.161	.009
		Within Groups		4918290.531	79	62256.842		
		Total		5364093.582	80			
	Net income from water dependent business * Gender of HH head	Between Groups	(Combined)	30.170	1	30.170	.003	.957
		Within Groups		301525.708	30	10050.857		
		Total		301555.879	31			
High infrastructure provision	House hold size * Gender of HH head	Between Groups	(Combined)	20.955	1	20.955	5.842	.017
		Within Groups		430.422	120	3.587		
		Total		451.377	121			
	Estimated total net monthly income of HH * Gender of HH head	Between Groups	(Combined)	815619.788	1	815619.788	4.007	.048
		Within Groups		2.422E7	119	203570.299		
		Total		2.504E7	120			
	Net income from water dependent business * Gender of HH head	Between Groups	(Combined)	36125.439	1	36125.439	1.050	.309
		Within Groups		2235534.314	65	34392.836		
		Total		2271659.753	66			
Medium infrastructure provision	House hold size * Gender of HH head	Between Groups	(Combined)	2.618	1	2.618	.687	.409
		Within Groups		419.373	110	3.812		
		Total		421.991	111			
	Estimated total net monthly income of	Between Groups	(Combined)	817475.103	1	817475.103	15.799	.000
		Within Groups		5640050.48	109	51743.5		

	HH * Gender of HH head			1		82		
		Total		6457525.58 4	110			
	Net income from water dependent business * Gender of HH head	Between Groups	(Comb ined)	1679.150	1	1679.15 0	.162	.689
		Within Groups		643491.739	62	10378.8 99		
Total		645170.889	63					
Low infrastru cture provisio n	House hold size * Gender of HH head	Between Groups	(Comb ined)	22.266	1	22.266	5.053	.026
		Within Groups		550.773	125	4.406		
		Total		573.039	126			
	Estimated total net monthly income of HH * Gender of HH head	Between Groups	(Comb ined)	809807.059	1	809807. 059	8.235	.005
		Within Groups		1.190E7	121	98341.0 97		
		Total		1.271E7	122			
	Net income from water dependent business * Gender of HH head	Between Groups	(Comb ined)	3348.103	1	3348.10 3	.222	.639
		Within Groups		1464751.92 4	97	15100.5 35		
		Total		1468100.02 7	98			

ANOVA FOR HOUSEHOLD SIZE IN OVERALL SAMPLE

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
House hold size * Category of community	Between Groups	(Combined)	3.168	3	1.056	.255	.858
	Within Groups		1816.895	439	4.139		
	Total		1820.063	442			

MEAN HOUSEHOLD SIZE BY GENDER IN OVERALL SAMPLE

Report				
House hold size				
Gender of HH head	Mean	N	Std. Deviation	Std. Error of Mean
Man	4.6165	339	1.92626	.10462
Woman	3.7885	104	2.22812	.21849
Total	4.4221	443	2.02923	.09641

ANALYSIS OF VARIANCE FOR MEAN HOUSEHOLD SIZE BY GENDER IN THE OVERALL SAMPLE

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
House hold size * Gender of HH head	Betw een Groups	(Combin ed)	54.570	1	54.570	13.631	.000
	Within Groups		1765.494	441	4.003		
	Total		1820.063	442			

MEAN MONTHLY HOUSEHOLD INCOME BY GENDER OF HOUSEHOLD HEAD IN THE OVERALL SAMPLE

Report				
Estimated total net monthly income of household				
Gender of HH head	Mean	N	Std. Deviation	Std. Error of Mean
Man	4.5576E2	335	367.70258	20.08974
Woman	2.6897E2	101	187.45991	18.65296
Total	4.1249E2	436	343.67983	16.45928

ANALYSIS OF VARIANCE FOR MEAN TOTAL MONTHLY INCOME BY GENDER IN THE OVERALL SAMPLE

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Estimated total net monthly income of HH * Gender of HH head	Betwe en Groups	(Combin ed)	2707729.840	1	2707729.840	24.144	.000
	Within Groups		4.867E7	434	112148.973		
	Total		5.138E7	435			

ANALYSIS OF VARIANCE FOR INCOME FROM WATER OCCUPATION IN THE OVERALL SAMPLE

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Net income from water dependent business * Gender of HH head	Between Groups	(Combined)	17.897	1	17.897	.001	.976
	Within Groups		5028627.344	260	19340.874		
	Total		5028645.240	261			

APPENDIX 4.31: ANALYSIS OF VARIANCE FOR MEAN PER CAPITA MONTHLY HOUSEHOLD INCOME BY COMMUNITY

ANOVA Table							
			Sum of Squares	df	Mean Square	F	Sig.
Monthly per capita household income * Location of community	Between Groups	(Combined)	288918.271	9	32102.030	5.233	.000
	Within Groups		2656237.526	433	6134.498		
	Total		2945155.797	442			

MULTIPLE COMPARISON OF MEAN PER CAPITA MONTHLY HOUSEHOLD INCOME

AGBOGBA

The mean monthly per capita household income at Agbogba was significantly higher than those of the following communities:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	42.01	8.07 to 76.09	0.015
Abofu	33.86	0.65 to 67.07	0.046
Nima	30.3	0.256 to 60.35	0.048
Sabon Zongo	37.53	4.24 to 70.93	0.028

DZORWULU

The mean monthly per capita household income at Dzorwulu was significantly higher than those of all the other communities except Kokomlemle

Community	Mean difference	C.I	P-value
Abokobi-Pantang	85.97	51.55 to 120.39	0.000
Agbogba	43.89	9.9 to 77.9	0.012
Abofu	77.75	44.12 to 111.4	0.000
Abelemkpe	52.63	17.98 to 87.3	0.003
Nima	74.2	43.68 to 104.7	0.000
Alajo	58.58	24.6 to 92.6	0.001
North Industrial Area	70.8	36.4 to 105.2	0.000
Sabon Zongo	81.43	47.6 to 115.2	0.000

KOKOMLEMLE

The mean monthly per capita household income at Kokomlemle was significantly higher than those of all the other communities except Agbogba, Abelemkpe, Dzorwulu:

Community	Mean difference	C.I	P-value
Abokobi-Pantang	61.35	27.54 to 95.2	0.000
Abofu	53.13	20.12 to 86.14	0.002
Nima	49.57	19.74 to 79.4	0.001
Alajo	33.96	0.566 to 67.36	0.046
North Industrial Area	46.18	12.4 to 79.99	0.008
Sabon Zongo	56.81	23.61 to 90.01	0.001

APPENDIX 4.32: ANALYSIS OF VARIANCE FOR MEAN PER CAPITA MONTHLY HOUSEHOLD INCOME AT THE CATEGORY OF COMMUNITY LEVEL BY GENDER OF HOUSEHOLD HEAD

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	189100.169	3	63033.390	10.040	.000
Within Groups	2756055.628	439	6278.031		
Total	2945155.797	442			

ANOVA Table								
Category of community				Sum of Squares	df	Mean Square	F	Sig.
Peri-urban	Mean monthly per capita household income * Gender of HH head	Between Groups	(Combined)	2789.300	1	2789.300	.577	.450
		Within Groups		386740.012	80	4834.250		
		Total		389529.312	81			
High infrastructure provision	Mean monthly per capita household income * Gender of HH head	Between Groups	(Combined)	215.173	1	215.173	.019	.891
		Within Groups		1359999.736	120	11333.331		
		Total		1360214.909	121			
Medium infrastructure provision	Mean monthly per capita household income * Gender of HH head	Between Groups	(Combined)	163.435	1	163.435	.030	.862
		Within Groups		592228.904	110	5383.899		
		Total		592392.338	111			
Low infrastructure provision	Mean monthly per capita household income * Gender of HH head	Between Groups	(Combined)	13.590	1	13.590	.004	.949
		Within Groups		413905.478	125	3311.244		
		Total		413919.068	126			

MULTIPLE COMPARISONS FOR MEAN PER CAPITA MONTHLY HOUSEHOLD INCOME AT THE CATEGORY LEVEL WITHOUT GENDER

Multiple Comparisons						
Mean monthly per capita household income						
LSD						
(I) Category of community	(J) Income group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Peri-urban	High infrastructure provision	-38.91735*	11.31462	.001	-61.1549	-16.6798
	Middle infrastructure provision	3.92077	11.51587	.734	-18.7123	26.5539
	Low infrastructure provision	12.38887	11.22473	.270	-9.6720	34.4498
High infrastructure provision	Peri-urban	38.91735*	11.31462	.001	16.6798	61.1549
	Middle infrastructure provision	42.83812*	10.36885	.000	22.4594	63.2169
	Low infrastructure provision	51.30622*	10.04453	.000	31.5649	71.0476
Medium infrastructure provision	Peri-urban	-3.92077	11.51587	.734	-26.5539	18.7123
	High infrastructure provision	-42.83812*	10.36885	.000	-63.2169	-22.4594
	Low infrastructure provision	8.46810	10.27069	.410	-11.7177	28.6539
Low infrastructure provision	Peri-urban	-12.38887	11.22473	.270	-34.4498	9.6720
	High infrastructure provision	-51.30622*	10.04453	.000	-71.0476	-31.5649
	Middle infrastructure provision	-8.46810	10.27069	.410	-28.6539	11.7177
*. The mean difference is significant at the 0.05 level.						

APPENDIX 4.33: INVESTMENT INTO SACHET WATER VENDING BY CATEGORIES OF COMMUNITIES

Category of community	Mean [GH¢]	Response
Peri-urban	153	16
High infrastructure communities	296	30
Medium infrastructure communities	124	28
Low infrastructure communities	202	35

MEAN MONTHLY INVESTMENT INTO WATER DEPENDENT OCCUPATIONS

Report					
Monthly investment					
Income group	Location of Respondent	Mean [GH¢]	N	Std. Deviation	Std. Error of Mean
Peri-urban	Abokobi/Pantang	1.8576E2	11	141.10781	42.54561
	Agbogba	1.6144E2	15	136.25326	35.18044
	Total	1.7173E2	26	136.05559	26.68270
High infrastructure provision	Abelemkpe	4.4426E2	27	566.13263	108.95228
	Dzorwulu	4.8452E2	26	470.09036	92.19230
	Kokomlemle	4.5335E2	24	529.51219	108.08622
	Total	4.6069E2	77	517.20317	58.94077
Medium infrastructure provision	Nima	3.4077E2	41	526.53156	82.23041
	Alajo	2.2044E2	22	303.47492	64.70107
	Total	2.9875E2	63	461.95175	58.20045
Low infrastructure provision	Abofu	3.3199E2	23	378.09447	78.83815
	Avenor/North Industrial	2.3457E2	28	247.38742	46.75183
	Sabon Zongo	2.1253E2	36	268.90958	44.81826
	Total	2.5120E2	87	296.10019	31.74527

CORRELATION BETWEEN MONTHLY INVESTMENT INTO WATER DEPENDENT OCCUPATION AND MEAN NET MONTHLY INCOME FROM OCCUPATION

Correlations				
Income group			Monthly investment	Net income from water dependent business
Peri-urban	Monthly investment	Pearson Correlation	1	.260
		Sig. (2-tailed)		.499
		N	26	9
	Net income from water dependent business	Pearson Correlation	.260	1
		Sig. (2-tailed)	.499	
		N	9	32
High infrastructure provision	Monthly investment	Pearson Correlation	1	.009
		Sig. (2-tailed)		.955
		N	77	39
	Net income from water dependent business	Pearson Correlation	.009	1
		Sig. (2-tailed)	.955	
		N	39	67
Medium infrastructure provision	Monthly investment	Pearson Correlation	1	-.164
		Sig. (2-tailed)		.347
		N	63	35
	Net income from water dependent business	Pearson Correlation	-.164	1
		Sig. (2-tailed)	.347	
		N	35	64
Low infrastructure provision	Monthly investment	Pearson Correlation	1	-.031
		Sig. (2-tailed)		.797
		N	87	72
	Net income from water dependent business	Pearson Correlation	-.031	1
		Sig. (2-tailed)	.797	
		N	72	99

APPENDIX 4.34: MONTHLY PROFITS FROM WATER DEPENDENT OCCUPATIONS AT COMMUNITY LEVEL

Community	Frequency (%) of profit levels				
	10-29	30-49	50-69	70-89	90-99
Abokobi-Pantang (8)	25	62.5	12.5		
Agbogba (19)	5.3	84.2	5.3	5.3	
Abelemkpe (22)	31.8	63.6	4.5		
Dzorwulu (16)	50	50			
Kokomlemle (25)	18	36	12	20	4
Nima (39)	35.8	38.4	20.6	5.1	
Alajo (14)	35.7	35.7	14.3	14.3	
Abofu (34)	35.3	53	5.9	5.9	
North Industrial Area (25)	20	56	16	4	4
Sabon Zongo (35)	34.3	17.2	25.7	20	2.9
Total sample (237)	30.8	46.4	13.1	8.4	1.3

MONTHLY PROFITS FROM WATER DEPENDENT OCCUPATIONS AT CATEGORY OF COMMUNITIES LEVEL

Profit levels	Frequency (%) of profit levels				
	P-urban (27)	High (63)	Medium (53)	Low (94)	Total sample (237)
10-29	11.1	34.9	35.9	30.9	30.8
30-49	77.7	49.2	37.8	30.4	46.4
50-69	7.4	6.4	18.8	16	13.1
70-89		8	7.5	2.1	8.4
90-99		1.6			1.3

APPENDIX 4.35: REQUIREMENTS FOR EXPANDING BUSINESS

Category of community [with sample size in parenthesis]	Funds	Suitable shop	More customers	Water storage tank	More or regular flow of water	Electricity	Low water bills	Reduced Cost of water	Other assistance	Total response
Peri-urban [N=82]	65 (13)	-	20 (4)	-	10 (2)	5 (1)	-	-	-	100 (20)
High infrastructure provision [N=122]	78.3 (36)	2.2 (1)	17.4 (8)	-	-	-	-	-	2.2 (1)	100 (46)
Medium infrastructure provision [N=112]	55.4 (31)	7.1 (4)	26.8 (15)	3.6 (2)	5.4 (3)	-	1.8 (1)	-	-	100 (56)
Low infrastructure provision [N=127]	58 (47)	7.4 (6)	27.2 (22)	1.2 (1)	2.5 (2)	-	2.5 (2)	1.2 (1)	-	100 (81)
Total sample [443]	62.6 (127)	5.4 (11)	24.1 (49)	1.5(3)	3.4 (7)	0.5 (1)	1.5 (3)	0.5 (1)	0.5 (1)	100 (203)

APPENDIX 4.36: EXPANDING BUSINESS IF ACCESS TO WATER IMPROVES

Category of community	Yes	No	Total
Peri-urban	60.6(20)	39.4(13)	100(33)
High infrastructure provision	59.4(41)	40.6(28)	100(69)
Medium infrastructure provision	84.7(50)	15.3(9)	100(59)
Low infrastructure provision	66 (64)	34(33)	100 (97)
Total	67.8(175)	32.2(83)	100(258)

APPENDIX 4.36B: OWNERSHIP OF BANK ACCOUNT

Category of community		Gender of household head		
		Man	Woman	Total
Peri-urban	Yes	72.6 (53)	37.5(3)	69.1(56)
	No	27.4(20)	62.5(5)	30.9(25)
	Total	100(73)	100(8)	100(81)
High infrastructure provision	Yes	71.3 (67)	64.3(18)	69.7(85)
	No	28.8 (27)	35.7(10)	29.5(36)
	Total	100(94)	100(28)	100(122)
Medium infrastructure provision	Yes	55.7 (49)	27.3 (6)	50 (55)
	No	44.3(39)	72.7(16)	50(55)
	Total	100(88)	100 (22)	100(110)
Low infrastructure provision	Yes	46.9 (38)	50(23)	48 (61)
	No	53.1 (43)	50(23)	52(66)
	Total	100(81)	100(46)	100(127)
Overall	Yes	61.6(207)	48.1(50)	58.4(257)
	No	38.4(129)	51.9(54)	41.6(183)

APPENDIX 4.37: HOUSEHOLDS' MEMBERSHIP OF A SAVINGS GROUP

Category of community	household member/s belong to savings group		Total
	Yes	No	
Income group Peri-urban	10.4 (11)	21.4 (71)	18.7 (82)
High infrastructure provision	29.2 (31)	27.4 (91)	27.9 (122)
Middle infrastructure provision	28.3(30)	23.5 (78)	24.7 (108)
Low infrastructure provision	32.1(34)	27.7 (92)	28.8 (126)
Total	100 (106)	100 (332)	100 (438)

APPENDIX 4.38: HOUSEHOLD MEMBERSHIP OF OCCUPATIONAL ASSOCIATION

Community	Frequency (%)		
	Yes	No	Total response
Abokobi/Pantang	(28.9)11	71.1(27)	(38)
Agbogba	100.0(40)		
Abofu	9.8(4)	90.2(37)	(41)
Abelemkpe	10.5(4)	89.5(34)	(38)
Dzorwulu	13.2(5)	86.8(33)	(38)

Nima	9.5(6)	90.5(57)	(63)
Kokomlemlle	15.0(6)	85.0(34)	(40)
Alajo	7.7(3)	92.3(36)	(39)
Avenor/North Industrial	5.7(2)	94.333	(35)
Sabon Zongo	21.4(9)	78.6 (33)	(42)
Overall sample	12.1(50)	87.7(363)	413

APPENDIX 4.39: HOUSEHOLD MEMBERSHIP OF OTHER ASSOCIATIONS

Community Location of Respondent	Frequency (%)		
	Yes	No	Total response
Abokobi/Pantang	23.7(9)	76.3(29)	38
Agbogba		100(32)	32
Abofu	7.5(3)	92.5 (37)	40
Abelemkpe	6.2 (2)	93.8(30)	32
Dzorwulu	12.8 (5)	87.2 (34)	39
Nima	7.2 (5)	92.8 (64)	69
Kokomlemlle	22.5 (9)	77.5(31)	40
Alajo	21.1 (8)	78.9 (30)	38
Avenor/North Industrial	10.8 (4)	89.2 (33)	37
Sabon Zongo	34.1(14)	65.9(27)	41
Overall sample	14.5 (59)	85.5 (347)	406

APPENDIX 4. 40: HOUSEHOLD INVOLVMENT IN RELIGIOUS LEADERSHIP

Community Location of Respondent	Frequency (%)		
	Yes	No	Total response
Abokobi/Pantang	22.5 (9)	77.5(31)	40
Agbogba	-	100 (40)	40
Abofu	14.3(6)	85.7(36)	42
Abelemkpe	15.4(6)	84.6(33)	39
Dzorwulu	23.1(9)	76.9(30)	39
Nima	8.6 (6)	91.4(64)	70
Kokomlemlle	26.8(11)	73.2(30)	41
Alajo	12.5(5)	87.5(35)	40
Avenor/North Industrial	10.3(4)	89.7 (35)	39
Sabon Zongo	19(8)	81(34)	42
Overall sample	14.7(64)	85.3(370)	434

APPENDIX 4.41: HOUSEHOLD MEMBER PLAYS A ROLE IN COMMUNITY LEADERSHIP

Community	Frequency (%)		
	Yes	No	Total response
Location of Respondent			
Abokobi/Pantang	20(8)	80(32)	40
Agbogba	7.1(3)	92.9(39)	42
Abofu	11.6(5)	88.4(38)	43
Abelemkpe	2.6(1)	97.4(38)	39
Dzorwulu	2.5(1)	97.5(39)	40
Nima	21.4(15)	78.6(55)	70
Kokomlemle	2.3(1)	97.7(42)	43
Alajo	12.2(5)	87.8(36)	41
Avenor/North Industrial	2.6(1)	97.4(38)	39
Sabon Zongo	7(3)	93(40)	43
Overall sample	9.8(43)	90.2(397)	440

APPENDIX 4.42: HOUSEHOLD MEMBER PLAYS A ROLE IN POLITICAL LEADERSHIP

Community	Frequency (%)		
	Yes	No	Total response
Location of Respondent			
Abokobi/Pantang	5(2)	95(38)	40
Agbogba		100(42)	42
Abofu		100(42)	42
Abelemkpe	2.6(1)	97.4(38)	39
Dzorwulu		100(40)	40
Nima	2.9(2)	97.1(67)	69
Kokomlemle	4.7(2)	95.3(41)	43
Alajo	2.4(1)	97.6(40)	41
Avenor/North Industrial	2.6(1)	97.4(38)	39
Sabon Zongo	4.7(2)	95.3(41)	43
Overall sample	2.5(11)	97.5(427)	438

APPENDIX 4.43: LACK OF JOB AS INDICATOR OF POVERTY

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	35(14)	30(12)	35(14)	100(40)
Agbogba	47.6(20)	38.1(16)	14.3(6)	42(100)
Abelemkpe	38.5(15)	17.9(7)	43.6(17)	100(39)
Dzorwulu	17.5(7)	40(16)	42.5(17)	100(40)
Kokomlemle	45.2(19)	35.7(15)	19(8)	100(42)
Nima	27.1(19)	40(28)	32.9(23)	100(70)
Alajo	52.4(22)	26.2(11)	21.4(9)	100(42)
Abofu	50(22)	18.2(8)	31.8(14)	100(44)
North Industrial Area	47.5(19)	32.5(13)	20(8)	100(40)
Sabon Zongo	31(13)	45.2(19)	23.8(10)	100(42)
Total response	38.5 (170)	32.9(145)	28.6(126)	100(441)

APPENDIX 4.44: INABILITY TO PROVIDE FOR HOUSEHOLD NEEDS

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	47.5 (19)	27.5(11)	25(10)	40(100)
Agbogba	47.6(20)	50(21)	2.4(1)	42(100)
Abelemkpe	38.5(15)	43.6(17)	17.9(7)	100(39)
Dzorwulu	27.5 (11)	40(16)	32.5(13)	100(40)
Kokomlemle	34.9(15)	39.5(17)	25.6 (11)	100(43)
Nima	24.3(17)	54.3(38)	21.4 (15)	100(70)
Alajo	54.8(23)	21.4 (9)	23.8(10)	100(42)
Abofu	43.2(19)	36 .4 (16)	20.5(9)	100(44)
North Industrial Area	32.5 (13)	50(20)	17.5(7)	100(40)
Sabon Zongo	35.7 (15)	33.3(14)	31(13)	100(42)
Total response	37.8(167)	40.5(179)	21.7 (96)	100(442)

APPENDIX 4.45: INABILITY TO AFFORD THREE SQUARE MEALS A DAY

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	25 (10)	17.5(7)	57.5(23)	100(40)
Agbogba	14.3(6)	42.9(18)	42.9(18)	100(42)
Abelemkpe	28.9(11)	44.7(17)	26.3(10)	100(38)
Dzorwulu	25.6(10)	10.3(4)	64.1(25)	100(40)
Kokomlemle	34.9(15)	34.9(15)	30.2(13)	100(43)
Nima	24.3(17)	42.9(30)	32.9(23)	100(70)
Alajo	50(21)	26.2(11)	23.8(100)	100(42)
Abofu	47.7(21)	38.6(17)	13.6(6)	100(44)
North Industrial Area	42.5(17)	45(18)	12.5(5)	100(40)
Sabon Zongo	46.5(20)	37.2(16)	16.3(7)	100 (43)
Total response	38.4 (170)	37.9(168)	23.7(105)	100(443)

APPENDIX 4.46: LOW LEVEL OF ACCESS TO WATER AND SANITATION

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	22.5 (9)	45(18)	32.5(13)	100(40)
Agbogba	9.5(4)	73.8(31)	16.7(7)	100(42)
Abelemkpe	23.1(9)	56.4(22)	20.5(8)	100(39)
Dzorwulu	17.5(7)	32.5(13)	50 (20)	100(40)
Kokomlemle	18.6 (8)	39.5(17)	41.9(18)	100(43)
Nima	25.7(18)	44.3(31)	30(21)	100(70)
Alajo	26.2 (11)	40.5(17)	33.3(14)	100 (42)
Abofu	20.5 (9)	56.8(25)	22.7(10)	100(44)
North Industrial Area	45 (18)	32.5 (13)	22.5 (9)	100(40)
Sabon Zongo	37.2 (16)	20.9(9)	41.9(18)	100(43)
Total response	24.6(109)	44.2(196)	31.2(138)	100(443)

APPENDIX 4.47: INABILITY TO AFFORD COST OF WATER AND SANITATION

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	35(14)	30(12)	35(14)	100(40)
Agbogba	40.5(17)	50(21)	9.5 (4)	100(42)
Abelemkpe	51.3(20)	35.9(14)	12.8 (5)	100 (39)
Dzorwulu	20 (8)	35(14)	45(18)	100(40)
Kokomlemle	34.9(15)	34.9(15)	30.2(13)	100(43)
Nima	24.3(17)	42.9(30)	32.9(23)	100(70)
Alajo	50(21)	26.2(11)	23.8(10)	100(42)
Abofu	47.7(21)	38.6(17)	13.6(6)	100 (44)
North Industrial Area	50(21)	26.2(11)	23.8(10)	100(42)
Sabon Zongo	46.5(20)	37.2(16)	16.3(7)	100(43)
Total response	38.4(170)	37.9 (168)	23.7 (105)	100(443)

APPENDIX 4.48: LOW FINANCIAL RESOURCES

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	45(18)	20(8)	35(14)	100(40)
Agbogba	45.2(19)	28.6(12)	26.2(11)	42(100)
Abelemkpe	46.2(18)	20.5(8)	33.3(13)	39(100)
Dzorwulu	27.5(11)	25(10)	47.5(19)	100(40)
Kokomlele	57.1(24)	21.4(9)	21.4(9)	100(42)
Nima	27.1(19)	44.3(31)	28.6(20)	100(70)
Alajo	70(28)	20(8)	10(4)	100(40)
Abofu	52.3(23)	18.2(8)	29.5(13)	100(44)
North Industrial Area	65(26)	25(10)	10(4)	100(40)
Sabon Zongo	51.2(22)	37.2(16)	11.6(5)	100(43)
Total response	47.3(208)	27.3(120)	25.5(112)	100(440)

APPENDIX 4.49: ASPECTS OF HOUSEHOLD COMPOSITION: EVIDENCE OF THE EXTENDED FAMILY STRUCTURE IN THE CITY

Parent					
	Number of parents	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2	18	4.1	100.0	100.0
Missing	System	425	95.9		
Total		443	100.0		

Grand parent					
	Number of grand parents	Frequency of household heads living with grand parent	Percent	Valid Percent	Cumulative Percent
Valid	1-2	1	.2	100.0	100.0
Missing	System	442	99.8		
Total		443	100.0		

Grand Child					
	Number of grand children	Frequency of households heads living with grand children	Percent	Valid Percent	Cumulative Percent
Valid	1-2	19	4.3	59.4	59.4
	3-4	6	1.4	18.8	78.1
	5-6	6	1.4	18.8	96.9
	7-8	1	.2	3.1	100.0
	Total	32	7.2	100.0	
Missing	System	411	92.8		
Total		443	100.0		

Sibling					
	Number of siblings	Frequency of household heads living with siblings	Percent	Valid Percent	Cumulative Percent
Valid	1-2	40	9.0	88.9	88.9
	3-4	2	.5	4.4	93.3
	5-6	3	.7	6.7	100.0
	Total	45	10.2	100.0	
Missing	System	398	89.8		
Total		443	100.0		

in-laws					
	Number of in-laws	Frequency of household heads living with in-laws	Percent	Valid Percent	Cumulative Percent
Valid	1-2	9	2.0	90.0	90.0
	5-6	1	.2	10.0	100.0
	Total	10	2.3	100.0	
Missing	System	433	97.7		
Total		443	100.0		

nephew					
	Number of nephews	Frequency of household heads living with their nephew	Percent	Valid Percent	Cumulative Percent
Valid	1-2	22	5.0	95.7	95.7
	3-4	1	.2	4.3	100.0
	Total	23	5.2	100.0	
Missing	System	420	94.8		
Total		443	100.0		

Niece					
	Number of niece	Frequency of household held living with their nieces	Percent	Valid Percent	Cumulative Percent
Valid	1-2	24	5.4	96.0	96.0
	3-4	1	.2	4.0	100.0
	Total	25	5.6	100.0	
Missing	System	418	94.4		
Total		443	100.0		

APPENDIX 4.50: LACK OF OWNERSHIP OF PHYSICAL ASSETS

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	35(14)	20(8)	45(18)	100(40)
Agbogba	38.1(16)	23.8(10)	38.1(16)	100(42)
Abelemkpe	34.2(13)	15.8(6)	50(19)	100(38)
Dzorwulu	10(4)	20(8)	70(28)	100(39)
Kokomlemle	28.6(12)	26.2(11)	45.2(19)	100(42)
Nima	14.5(10)	18.8(13)	66.7(46)	100(69)
Alajo	42.5(17)	30(12)	27.5(11)	100(40)
Abofu	52.3(23)	9.1(4)	38.6(17)	100(44)
North Industrial Area	47.5(19)	35(14)	17.5(7)	100(40)
Sabon Zongo	20.9(9)	32.6(14)	46.5(20)	100(43)
Total response				

APPENDIX 4.51a: SOCIAL VICES AS AN INDICATOR OF POVERTY

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	25(10)	12.5(5)	62.5(25)	100(40)
Agbogba	28.6(12)	64.(27)	7.1(3)	100(42)
Abelemkpe	35.9 (14)	33.3(13)	30.8(12)	100(39)
Dzorwulu	35.9(14)	12.8(5)	51.3(20)	100(39)
Kokomlemle	9.8(4)	36.6(15)	53.7(22)	100(41)
Nima	15.7(11)	50(35)	34.3(24)	100(70)
Alajo	33.3	26.2	40.5	100(42)
Abofu	20.5(9)	45.5(20)	34.1(15)	100(44)
North Industrial Area	17.5(7)	40(16)	42.5(17)	100(40)
Sabon Zongo	16.7(7)	33.3(14)	50(21)	100(42)
Total response				

APPENDIX 4.51b: SOCIAL SECURITY [lack of investments for tomorrow]

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	26.3(10)	10.5(4)	63.2(24)	100(38)
Agbogba	11.9(5)	40.5(17)	47.6(20)	100(42)
Abelemkpe	17.9(7)	38.5(15)	43.6 (17)	100(39)
Dzorwulu	15(6)	22.5(9)	62.5(25)	100(40)
Kokomlemle	19(8)	38.1 (16)	42.9 (18)	100(42)
Nima	17.1 (12)	47.1(33)	35.7(25)	100(70)
Alajo	14.3 (6)	38.1(16)	47.6(20)	100(42)
Abofu	13.6(6)	36.4 (16)	50(22)	100 (44)
North Industrial Area	30(12)	32.5(13)	37.5 (15)	100(40)
Sabon Zongo	11.6(5)	46.5(20)	41.9(18)	100(430)
Total response	17.5(77)	36.1(159)	46.4 (204)	100 (440)

APPENDIX 4.52: POOR HEALTH STATUS

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	39.5(15)	26.3(10)	34.2(13)	100(38)
Agbogba	2.4(1)	83.3(35)	14.3(6)	100(42)
Abelemkpe	20.5 (8)	46.2(18)	33.3(13)	100(39)
Dzorwulu	10.5 (4)	26.3 (10)	63.2 (24)	100(38)
Kokomlemle	34.9 (15)	34.9(15)	30.2(13)	100(43)
Nima	24.3 (17)	42.9(30)	32.9 (23)	100 (70)
Alajo	50(21)	26.2(11)	23.8(100)	100 (42)
Abofu	47.7(21)	38.6(17)	13.6(6)	100(44)
North Industrial Area	42.5 (17)	45(18)	12.5(5)	40(100)
Sabon Zongo	46.5(20)	37.2(16)	16.3 (7)	100(43)
Total response	24.5(106)	41.1(178)	34.4 (149)	100(433)

APPENDIX 4.53: POOR MENTAL STATE [worries, too much thinking about how to survive]

Community	Response			
	very important	important	Less important	Total response
Abokobi-Pantang	38.5 (15)	41(16)	20.5(8)	100(39)
Agbogba	54.8(23)	33.3(14)	11.9(5)	100(42)
Abelemkpe	61.5(24)	20.5(8)	17.9(7)	100(39)
Dzorwulu	32.5(13)	40(16)	27.5(11)	100(40)
Kokomlemle	44.2 (19)	39.5(17)	16.3(7)	100(43)
Nima	20(14)	54.3(38)	25.7(18)	100(70)
Alajo	69 (29)	16.7 (7)	14.3 (6)	100 (42)
Abofu	54.5(24)	22.7 (10)	22.7(10)	100(44)
North Industrial Area	57.5 (23)	35(14)	7.5(3)	100(40)

Sabon Zongo	39.5(17)	34.9(15)	25.6 (11)	100(43)
Total response	45.5(201)	35.1(155)	19.5(86)	100(442)

APPENDIX 4.54: Weights for the Principal Component Analysis (PCA)

Asset	Weight 1	Weight 2
Health Insurance	.175	.019
Household bank Acc	.410	-.069
HH member in savings group	.166	.188
HH member accessed credit or loan	.183	.117
Ownership of livestock	.024	.066
Political leadership	.063	.114
Religious leadership	.269	.041
Membership of occupational association	.182	.050
Tap water connection residence	.506	-.241
Water obtained at PURC rate	.484	-.292
House	.365	-.083
Flush toilet	.625	-.230
Mains electricity	.225	.022
Car	.611	-.069
Bike	.161	.206
Motor bike	.034	.249
Gas stove	.537	-.038
watch or clock	.450	.033
Sewing machine	.363	.052
Electric iron	.572	.333
Refrigerator	.685	.316
Television	.669	.431
Radio or tape recorder	.626	.405
Video deck	.304	.316
DVD player	.596	.347
Mobile phone	.511	.232
Other toilet	-.109	-.113
Bathroom	.300	-.208
Single room detached or compound house	-.448	.245
Double room self contained detached or compound H	.165	-.233
Double room compound or detached	-.021	.006
Three or more rooms	.454	-.067
Access to public toilet	-.455	.359
Formal employment 1	.342	-.399
Informal employment 1	-.021	.332
Informal employment 2	.029	.449
Low education 1	-.308	.539
Low education 2	-.160	.575

Medium education 1	.295	-.197
High education 1	.417	-.405

APPENDIX 4.55: HOUSEHOLDS' SOCIO-ECONOMIC SCORES 1 AND 2

Report			
Location of Respondent		Socio-economic score one	Socioeconomic score two
Abokobi/Pantang [N=40]	Mean	5.4806	3.3111
	Std. Deviation	3.38999	1.64909
	Std. Error of Mean	.53600	.26074
Agbogba [N=42]	Mean	6.9890	2.4076
	Std. Deviation	2.20843	1.14984
	Std. Error of Mean	.34077	.17742
Abelemkpe [N=39]	Mean	9.0552	2.5275
	Std. Deviation	4.29283	1.77259
	Std. Error of Mean	.68740	.28384
Dzorwulu [N=40]	Mean	9.3602	2.4789
	Std. Deviation	3.43887	1.72295
	Std. Error of Mean	.54373	.27242
Kokomlemle [N=43]	Mean	7.3333	2.7089
	Std. Deviation	3.60735	1.30582
	Std. Error of Mean	.55012	.19914
Nima [N=70]	Mean	5.9375	3.6161
	Std. Deviation	2.20001	1.13996
	Std. Error of Mean	.26295	.13625
Alajo [N=42]	Mean	5.8563	3.1505
	Std. Deviation	2.76836	1.24253
	Std. Error of Mean	.42717	.19173
Abofu [N=44]	Mean	7.5455	3.0717
	Std. Deviation	2.85272	1.44545
	Std. Error of Mean	.43006	.21791
Avenor/North Industrial [N=40]	Mean	5.5774	3.6591
	Std. Deviation	2.90257	1.27201
	Std. Error of Mean	.45894	.20112
Sabon Zongo [N=43]	Mean	4.8241	3.7227
	Std. Deviation	2.13103	.99134
	Std. Error of Mean	.32498	.15118
Total [N=443]	Mean	6.7264	3.1034
	Std. Deviation	3.28051	1.44187
	Std. Error of Mean	.15586	.06851

APPENDIX 4.56: MULTIPLE COMPARISONS OF SOCIO-ECONOMIC SCORES 1 AND 2 AT THE COMMUNITY LEVEL

SOCIO-ECONOMIC SCORE 1

AGBOGBA

The mean socio-economic score 1 of households at Agbogba was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	PV
Abokobi-Pantang	1.50835	0.2096 to 2.8071	0.023
North Industrial Area	1.4116	0.1128 to 2.7104	0.033
Sabon Zongo	2.165	0.8895 to 3.4402	0.001

ABELEMKPE

The mean socio-economic score 1 at Abelemkpe was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	PV
Abokobi-Pantang	3.57	2.25 to 4.9	0.000
Agbogba	2.067	0.759 to 3.37	0.002
Abofu	1.51	0.22 to 2.8	0.022
Nima	3.12	1.94 to 4.29	0.000
Kokomlemle	1.72	0.422 to 3.022	0.01
Alajo	3.199	1.89 to 4.51	0.000
North Industrial Area	3.5	2.16 to 4.8	0.000
Sabon Zongo	4.23	2.93 to 5.53	0.000

DZORWULU

The mean socio-economic score 1 at Dzorwulu was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	PV
Abokobi-Pantang	3.88	2.57 to 5.194	0.000
Agbogba	2.37	1.07 to 3.67	0.000
Kokomlemle	2.03	0.74 to 3.32	0.002
Nima	3.42	2.26 to 4.6	.000
Alajo	3.5	2.21 to 4.8	0.000
Abofu	1.82	0.53 to 3.099	0.006
North Industrial Area	3.78	2.47 to 5.1	0.000
Sabon Zongo	4.54	3.24 to 5.83	0.000

ABOFU

The mean socio-economic score 1 at Abofu was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	PV
Abokobi-Pantang	2.065	0.781 to 3.349	0.002
Nima	1.608	0.447 to 2.74	0.005
Alajo	1.689	0.4211 to 2.957	0.009
North Industrial Area	1.97	0.684 to 3.25	0.003
Sabon Zongo	2.72	1.46 to 3.98	0.000

KOKOMLEMLE

The mean socio-economic status 1 at Kokomlemle was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	PV
Abokobi-Pantang	1.85	0.56 to 3.14	0.005
Nima	1.4	0.26 to 2.53	0.016
Alajo	1.48	0.202 to 2.75	0.023
North Industrial Area	1.76	0.465 to 3.05	0.008
Sabon Zongo	2.51	1.241 to 3.78	0.000

SOCIO-ECONOMIC SCORE 2

ABOKOBI-PANTANG

The mean socio-economic score 2 at Abokobi-Pantang was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	0.903	0.301 to 1.499	0.003
Abelemkpe	0.784	0.177 to 1.39	0.011
Dzorwulu	0.832	0.229 to 1.44	0.007
Kokomlemle	0.602	0.01 to 1.194	0.046

NIMA

The mean socio-economic score 2 at Nima was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	1.21	0.68 to 1.74	0.000
Abelemkpe	1.09	0.55 to 1.63	0.000
Dzorwulu	1.14	0.603 to 1.67	0.000
Kokomlemle	0.91	0.39 to 1.43	
Abofu	0.544	0.03 to 1.063	0.04

ALAJO

The mean socio-economic score 2 at Alajo was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	0.743	0.155 to 1.331	0.013
Abelemkpe	0.623	0.024 to 1.22	0.042
Dzorwulu	0.671	0.076 to 1.27	0.027

ABOFU

The mean socio-economic score 2 at Abofu was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	0.6641	0.083 to 1.246	0.025
Dzorwulu	0.593	0.004 to 1.182	0.048

NORTH INDUSTRIAL AREA

The mean socio-economic score 2 at North Industrial Area was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	1.251	0.656 to 1.85	0.000
Abelemkpe	1.132	0.53 to 1.74	0.000
Dzorwulu	1.18	0.53 to 1.78	0.000
Kokomlemle	0.95	0.36 to 1.54	0.002

SABON ZONGO

The mean socio-economic score 2 at Sabon Zongo was significantly higher than those at the following communities:

Community	Mean difference	95% C.I	P-value
Agbogba	1.32	0.73 to 1.9	0.000
Abofu	0.651	0.073 to 1.23	0.027
Abelemkpe	1.2	0.599 to 1.791	0.000
Dzorwulu	1.24	0.652 to 1.84	0.000
Kokomlemle	1.014	0.433 to 1.6	0.001

APPENDIX 4.57: MEAN SOCIO-ECONOMIC SCORE 1 AND 2 AT THE CATEGORY OF COMMUNITY LEVEL

Report				
Category of community	Gender of HH head		Socio-economic score one	Socio-economic score two
Peri-urban	Man	Mean	6.3195	2.8084
		N	74	74
		Std. Deviation	2.89816	1.41742
		Std. Error of Mean	.33690	.16477
	Woman	Mean	5.6395	3.2179
		N	8	8
		Std. Deviation	3.34402	2.03951
		Std. Error of Mean	1.18229	.72107
	Total	Mean	6.2532	2.8483
		N	82	82
		Std. Deviation	2.92871	1.47820
		Std. Error of Mean	.32342	.16324
High infrastructure provision	Man	Mean	8.1163	2.5552
		N	94	94
		Std. Deviation	3.46992	1.63167
		Std. Error of Mean	.35790	.16829
	Woman	Mean	9.9985	2.6437
		N	28	28
		Std. Deviation	4.75986	1.49380
		Std. Error of Mean	.89953	.28230
	Total	Mean	8.5483	2.5755
		N	122	122
		Std. Deviation	3.86540	1.59549
		Std. Error of Mean	.34996	.14445
Medium infrastructure provision	Man	Mean	6.0415	3.4686
		N	90	90
		Std. Deviation	2.53953	1.15874
		Std. Error of Mean	.26769	.12214
	Woman	Mean	5.3570	3.3305
		N	22	22
		Std. Deviation	1.77399	1.35963
		Std. Error of Mean	.37822	.28987
	Total	Mean	5.9071	3.4415
		N	112	112
		Std. Deviation	2.41682	1.19555
		Std. Error of Mean	.22837	.11297
Low infrastructure	Man	Mean	5.9440	3.8073

provision		N	81	81	
		Std. Deviation	2.93845	1.29221	
		Std. Error of Mean	.32649	.14358	
	Woman	Mean	6.1103	2.8958	
		N	46	46	
		Std. Deviation	2.78635	1.02646	
		Std. Error of Mean	.41083	.15134	
	Total	Mean	6.0042	3.4771	
		N	127	127	
		Std. Deviation	2.87427	1.27669	
		Std. Error of Mean	.25505	.11329	

ANALYSIS OF VARIANCE FOR SOCIO-ECONOMIC SCORE 1 AND 2: CATEGORY OF COMMUNITY BY GENDER							
Category of community			Sum of Squares	df	Mean Square	F	Sig.
Peri-urban	Socio-economic status one	Between Groups	3.338	1	3.338	.386	.536
		Within Groups	691.427	80	8.643		
		Total	694.765	81			
	Socio-economic two	Between Groups	1.211	1	1.211	.551	.46;0
		Within Groups	175.780	80	2.197		
		Total	176.991	81			
High infrastructure provision	Socio-economic status one	Between Groups	76.428	1	76.428	5.297	.023
		Within Groups	1731.473	120	14.429		
		Total	1807.901	121			
	Socio-economic score two	Between Groups	.169	1	.169	.066	.798
		Within Groups	307.848	120	2.565		
		Total	308.017	121			
Medium infrastructure provision	Socio-economic status one	Between Groups	8.285	1	8.285	1.424	.235
		Within Groups	640.067	110	5.819		
		Total	648.352	111			
	Socio-economic score two	Between Groups	.337	1	.337	.234	.629
		Within Groups	158.319	110	1.439		
		Total	158.656	111			
Low infrastructure provision	Socio-economic score one	Between Groups	.812	1	.812	.098	.755
		Within Groups	1040.129	125	8.321		
		Total	1040.941	126			
	Socio-economic score two	Between Groups	24.373	1	24.373	16.832	.000
		Within Groups	180.998	125	1.448		
		Total	205.371	126			

Total sample			
Gender of HH head		Socio-economic status one	Socio-economic two
Man	Mean	6.7869	3.0567
	N	339	339
	Std. Deviation	2.91919	1.30733
	Std. Error of Mean	.15855	.07100
Woman	Mean	7.3492	3.1158
	N	104	104
	Std. Deviation	4.14190	1.71960
	Std. Error of Mean	.40615	.16862
Total	Mean	6.9189	3.0706
	N	443	443
	Std. Deviation	3.25134	1.41304
	Std. Error of Mean	.15448	.06714

ANOVA Table—For Total Sample							
			Sum of Squares	df	Mean Square	F	Sig.
Socio-economic status one * Gender of HH head	Between Groups	(Combined)	25.163	1	25.163	2.388	.123
	Within Groups		4647.313	441	10.538		
	Total		4672.476	442			
Socioeconomic status two * Gender of HH head	Between Groups	(Combined)	.278	1	.278	.139	.709
	Within Groups		882.250	441	2.001		
	Total		882.528	442			

APPENDIX 4. 58: MEAN NUMBER OF FORMAL AND INFORMAL OCCUPATIONS AT THE COMMUNITY LEVEL

Report			
Location of Respondent		Total informal occupation	Total formal occupation
Abokobi/Pantang	Mean	1.5500	.2750
	N	40	40
	Std. Deviation	.67748	.55412
	Std. Error of Mean	.10712	.08761
Agbogba	Mean	1.4524	.4048
	N	42	42
	Std. Deviation	.73923	.58683
	Std. Error of Mean	.11407	.09055
Abelemkpe	Mean	1.6923	.5128
	N	39	39
	Std. Deviation	.83205	.64367
	Std. Error of Mean	.13323	.10307
Dzorwulu	Mean	1.4250	.5250
	N	40	40
	Std. Deviation	.71208	.64001
	Std. Error of Mean	.11259	.10119
Kokomlemlé	Mean	1.4186	.3023
	N	43	43
	Std. Deviation	.76322	.51339

	Std. Error of Mean	.11639	.07829
Nima	Mean	1.7286	.2571
	N	70	70
	Std. Deviation	.72074	.50176
	Std. Error of Mean	.08614	.05997
Alajo	Mean	1.7143	.3095
	N	42	42
	Std. Deviation	.70834	.60438
	Std. Error of Mean	.10930	.09326
Abofu	Mean	1.6364	.2955
	N	44	44
	Std. Deviation	.89159	.50942
	Std. Error of Mean	.13441	.07680
Avenor/North Industrial	Mean	1.8500	.2000
	N	40	40
	Std. Deviation	.69982	.46410
	Std. Error of Mean	.11065	.07338
Sabon Zongo	Mean	1.7442	.2326
	N	43	43
	Std. Deviation	.69327	.52722
	Std. Error of Mean	.10572	.08040
Total	Mean	1.6275	.3251
	N	443	443
	Std. Deviation	.75138	.55713
	Std. Error of Mean	.03570	.02647

APPENDIX 4.59: MULTIPLE COMPARISONS AT THE COMMUNITY LEVEL

Formal occupation

ABELEMKPE

The mean number of formal occupations engaged in by households in Abelemkpe was significantly higher than those engaged in by households in the following communities:

Community	Mean difference	95% C.I	P-Value
Nima	0.26	0.0385 to 0.4729	0.021
North Industrial Area	0.31	0.0682 to 0.5575	0.012
Sabon Zongo	0.28	0.0399 to 0.5206	0.022

DZORWULU

The mean number of formal occupations engaged in by households in Dzorwulu was significantly higher than those engaged in by the following communities:

Community	Mean difference	95% C.I	P-Value
Abokobi-Pantang	0.25	0.0069 to 0.4931	0.0069
Nima	0.27	0.0524 to 0.4833	0.015
North Industrial Area	0.325	0.0819 to 0.5681	0.009
Sabon Zongo	0.292	0.0536 to 0.5312	0.017

Informal occupation

NIMA

The mean number of informal occupations engaged in by households in Nima was significantly higher than those engaged in by the following communities

Community	Mean difference	95% C.I	P-Value
Dzorwulu	0.304	0.0131 to 0.594	0.041
Kokomlemle	0.31	0.026	0.032

NORTH INDUSTRIAL AREA

The mean number of informal occupations engaged in by households in Nima was significantly higher than the following communities:

Community	Mean difference	95% C.I	P-Value
Agbogba	0.4	0.0738 to 0.7214	0.016
Dzorwulu	0.425	0.0973 to 0.7527	0.011
Kokomlemle	0.431	0.1095 to 0.7533	0.009

SABON ZONGO

The mean number of informal occupations engaged in by households in Sabon Zongo was significantly higher than that of Kokomlemle:

Community	Mean difference	95% C.I	P-Value
Kokomlemle	0.326	0.0095 to 0.6416	0.044

APPENDIX 4.60: MEAN NUMBER OF FORMAL AND INFORMAL OCCUPATIONS AT THE CATEGORY OF COMMUNITY LEVEL

Category of community	Gender of HH head	Informal occupation				Formal occupation			
		Mean	N	SD	SE	Mean	N	SD	SE
Peri-urban	M	1.51	74	0.73	0.0844	0.38	74	0.59	0.07
	W	1.37	8	0.52	0.183	-	8	-	-
	T	1.5	82	0.71	0.078	0.34	82	0.57	0.063
High infrastructure provision	M	1.56	94	0.81	.084	0.51	94	0.63	0.065
	W	1.32	28	0.61	0.11	0.21	28	0.42	0.08
	T	1.51	122	0.77	0.116	0.44	122	0.6	0.055
Medium infrastructure provision	M	1.78	90	0.73	0.08	0.33	90	0.58	0.06
	W	1.5	22	0.6	0.13	0.05	22	0.21	0.05
	T	1.72	112	0.71	0.07	0.28	112	0.54	0.05
Low infrastructure provision	M	1.93	81	0.74	0.08	0.31	81	0.56	0.06
	W	1.4	46	0.72	0.11	0.13	46	0.34	0.05
	T	1.74	127	0.77	0.07	0.24	127	0.5	0.044

ANALYSIS OF VARIANCE FOR MEAN NUMBER OF FORMAL AND INFORMAL OCCUPATIONS IN MALE AND FEMALE HEADED HOUSEHOLDS								
Category of community				Sum of Squares	df	Mean Square	F	Sig.
Peri-urban	Informal	Between Groups	(Combined)	.139	1	.139	.275	.602
		Within Groups		40.361	80	.505		
		Total		40.500	81			
	Formal	Between Groups	(Combined)	1.034	1	1.034	3.255	.075
		Within Groups		25.405	80	.318		
		Total		26.439	81			
High infrastructure provision	Informal	Between Groups	(Combined)	1.268	1	1.268	2.136	.147
		Within Groups		71.224	120	.594		
		Total		72.492	121			
	Formal	Between Groups	(Combined)	1.895	1	1.895	5.387	.022
		Within Groups		42.204	120	.352		
		Total		44.098	121			
Middle infrastructure	Informal	Between Groups	(Combined)	1.364	1	1.364	2.725	.102

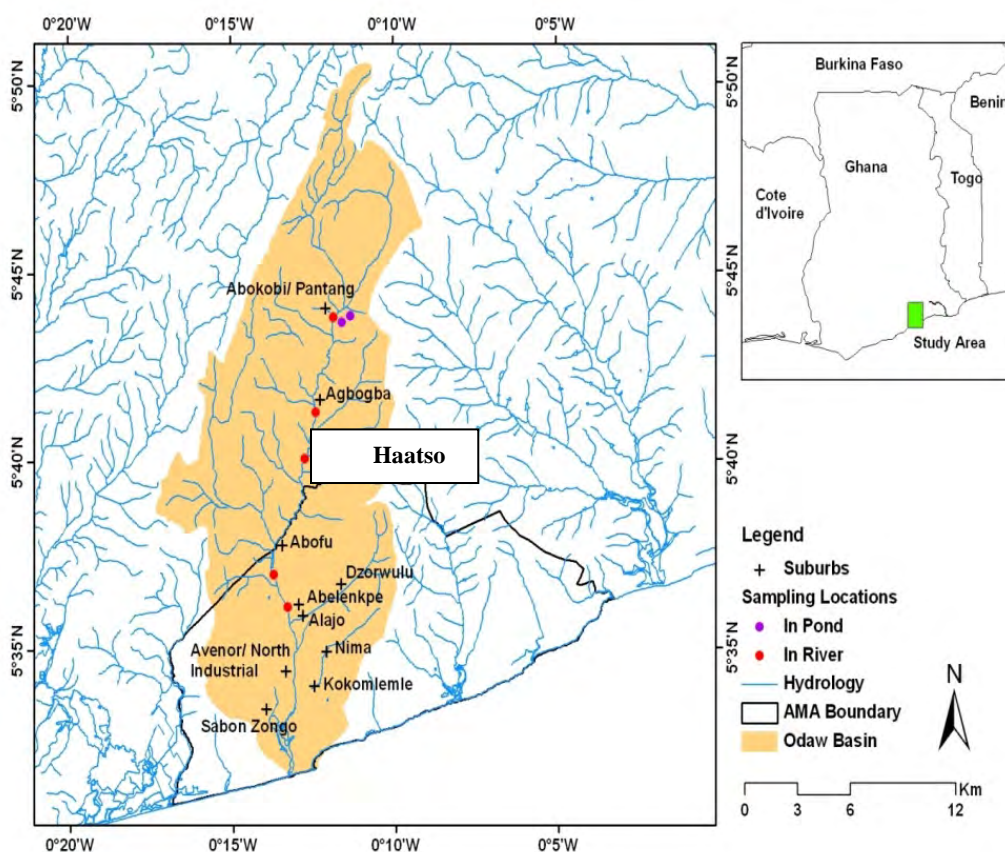
re provision		Within Groups		55.056	110	.501		
		Total		56.420	111			
	Formal	Between Groups	(Combined)	1.465	1	1.465	5.206	.024
		Within Groups		30.955	110	.281		
	Total		32.420	111				
Low infrastructure provision	Informal	Between Groups	(Combined)	7.717	1	7.717	14.461	.000
		Within Groups		66.708	125	.534		
		Total		74.425	126			
	Formal	Between Groups	(Combined)	.932	1	.932	3.818	.053
		Within Groups		30.501	125	.244		
		Total		31.433	126			

APPENDIX 5.1: QUALITY OF SELECTED WATER SOURCES IN THE ODAW-KORLE RIVER CATCHMENT

Seven water samples were collected from five sampling locations [Abokobi-Pantang (with three samples in total); Agbogba; Haatso; Abofu; and Abelemkpe] in four of the ten selected communities (Figure 1), and an additional location (Haatso: which comes between Agbogba and Abofu) on the stretch of the river over a period of six months. The essence of including Haatso, which was not one of the selected communities, was that, in terms of the stretch of the river, that location appeared to be a point where evidence of waste water discharges and other human influence begins to increase in comparison with Abokobi-Pantang and Agbogba due to urbanisation. Therefore it is an interphase between the peri-urban water quality and the urban water quality.

In Abokobi-Pantang, there are several ponds which community members access for various domestic activities. This is why two of the ponds which were frequently fetched for various domestic activities were also sampled in addition to the river for quality analysis.

Figure 1: Map of selected communities (suburbs) and water sampling locations in the Odaw-Korle Catchment



It was important to sample the water for some physical and chemical analysis because the results were to throw light on some of the community perceptions of water quality. The parameters analysed for in the water samples are part of the standard parameters considered in water quality investigation. Each of the seven water samples were analysed for the ten parameters defined below. The reasons for these specific parameters are also indicated.

Temperature

Water temperature has direct and indirect effects on nearly all aspects of stream ecology. The amount of oxygen that can be dissolved in water is partly governed by temperature. Temperature also influences the rate of photosynthesis by algae and aquatic plants. Industrial activities also directly influence stream temperatures. Approximate upper limits range from 38°C for fish and 50°C for aquatic insects to 73°C for blue-green algae (Water Encyclopaedia, 2011). *Temperature was analysed for to provide information on whether any discharges are affecting aquatic life. This is important because of its relationship with other parameters important for safe water quality.*

Acidity or basicity (pH)

The pH of river (water) is the measure of how acidic or basic the water is on a scale of 0-14. It is a measure of hydrogen ion concentration. Extremes in pH can make a river inhospitable to life. The pH of the water is important because it affects the solubility and availability of nutrients, and how they can be utilized by aquatic organisms. The pH of water is influenced by the substance over which it runs (Ansa-Asare, 2000). Concentration of ions leads to rise of pH in the dry season (Chapman, 1992). Natural background concentration of fresh water pH is 6.5-8.5 (EPA, 2000). *Acidity was measured to ascertain whether there was a form of occurrence of some form of chemical pollution which can influence the natural background concentration of the water.*

Conductivity

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminium cations (ions that carry a positive charge). Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Discharges to streams can change the conductivity depending on their contents. A failing sewage system would raise the conductivity because of the presence of chloride, phosphate, and nitrate (USA-EPA, 2011). *This was analyzed for to investigate human waste and wastewater influence.*

Turbidity

Turbidity is the measure of relative clarity of a liquid. During a rainstorm, particles from the surroundings are washed into rivers and other water sources with a corresponding higher turbidity values. Areas likely to contribute more are bare lands, farm lands or activities that remove earth. Also, during high flows, water velocities are faster and water volumes are higher, which can more easily stir up and suspend material from the stream bed, causing higher turbidities (USA-GS, 2011). *It was important to analyze for turbidity because it provides information on how human interaction with the land is releasing earth pollutants into the river.*

Dissolved oxygen (DO) and Biochemical oxygen demand (BOD₅)

Dissolved oxygen (DO) is one of the most important river (water) quality indicators. Elements that consume oxygen in water include: biological oxidation of carbonaceous and nitrogenous organic matter, respiration, of aquatic plants and animals, decomposition of bottom deposits and immediate oxygen demand of wastewater

containing reducing substances (Jorgensen, 1983). Dissolved oxygen is therefore an important indicator of the health of an aquatic system. Natural organic detritus and organic waste from waste water treatment plants, failing septic systems, and agricultural and urban runoff, acts as a food source for water-borne bacteria. Bacteria decompose these organic materials using dissolved oxygen, thus reducing the DO present for fish. Biochemical oxygen demand (BOD₅) is a measure of the amount of oxygen that bacteria will consume while decomposing organic matter under aerobic conditions (Jorgensen, 1983).

Biochemical oxygen demand is determined by incubating a sealed sample of water for five days and measuring the loss of oxygen from the beginning to the end of the test (NGRDC, 2011) (see chapter 3: section 3.3.5). Usually, the higher the amount of organic material (or organic pollutants such as food waste or human waste etc) found in the river, the more oxygen is used for aerobic oxidation (Bordin, 1997). According to Chapman (1992), unpolluted waters have BOD₅ of water at 2mg l⁻¹ or less. *Therefore both dissolved oxygen and biochemical oxygen levels were important as indicators of organic pollution from either solid or human waste from the communities and their surroundings.*

Chemical oxygen demand

The amount of oxygen needed to consume the organic and inorganic materials is called the Chemical Oxygen Demand (COD). Thus COD does not differentiate between biologically available and inert organic matter. There exists a definite correlation between the COD and BOD under certain conditions and by determining the COD, the information about the BOD of the water/wastewater can be derived. Chemical oxygen demand values are always greater than BOD₅ values, but COD measurements can be made in a few hours while BOD₅ measurements take five days (WPPDG, 2011) (see chapter 3: section 3.3.5). *Therefore COD measurements were to provide additional information on organic and inorganic pollution.*

Phosphate and Nitrate

Nutrients such as phosphorous and nitrogen are essential for the growth of algae and other plants. Aquatic life is dependent upon these photosynthesizers, which usually occur in low levels in surface water. Excess nitrate leads to algal blooms in water which may become toxic to animals in water and problems for humans. Bacterial respiration and organic decomposition (of algal blooms) can use up dissolved oxygen, depriving fish and invertebrates of available oxygen in the water (eutrophication). Fertilizers, failing septic systems, waste water treatment plant discharges, and wastes from pets and farm animals are typical sources of excess nutrients in surface waters (NGRDC, 2011). *This was also to provide information on extent of organic pollution and inorganic pollution to the river.*

Faecal coliforms

Faecal coliforms occur in normal and abnormal human and animal faeces. It is from this point that they contaminate other sites (Stokes and Ridgway, 1987). The presence of faecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the faecal material of man or other animals. High quantities of faecal coliform bacteria suggest the presence of disease causing agents. *This was therefore to help draw conclusions on the likelihood of human or animal waste pollution in the surroundings.*

Physical and Chemical Parameters

Temperature, Turbidity, pH, Conductivity

Figure 2: Mean water temperature at selected locations

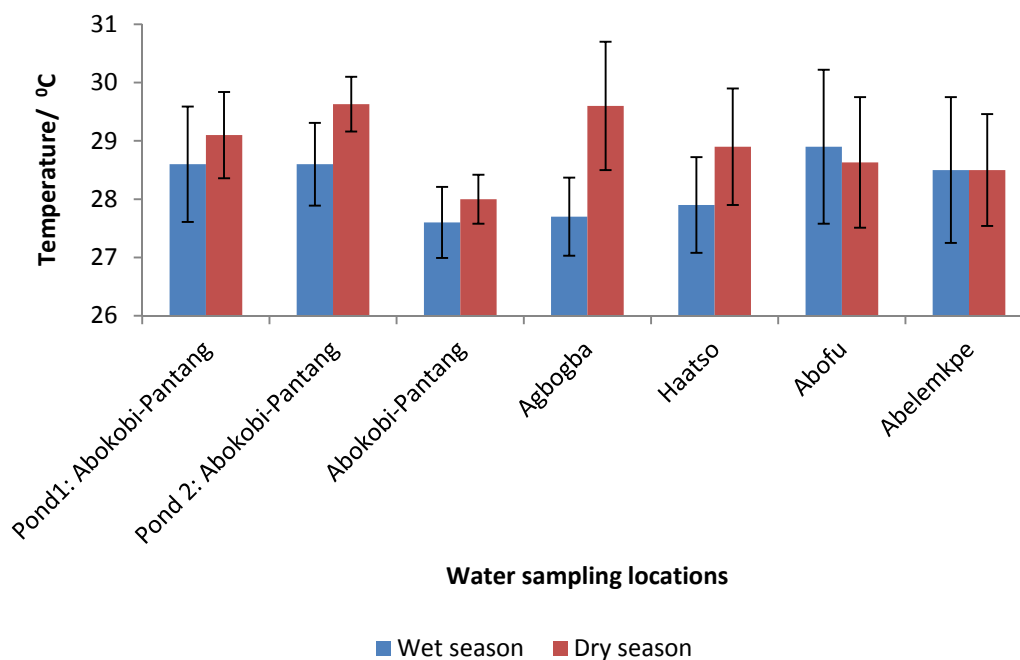
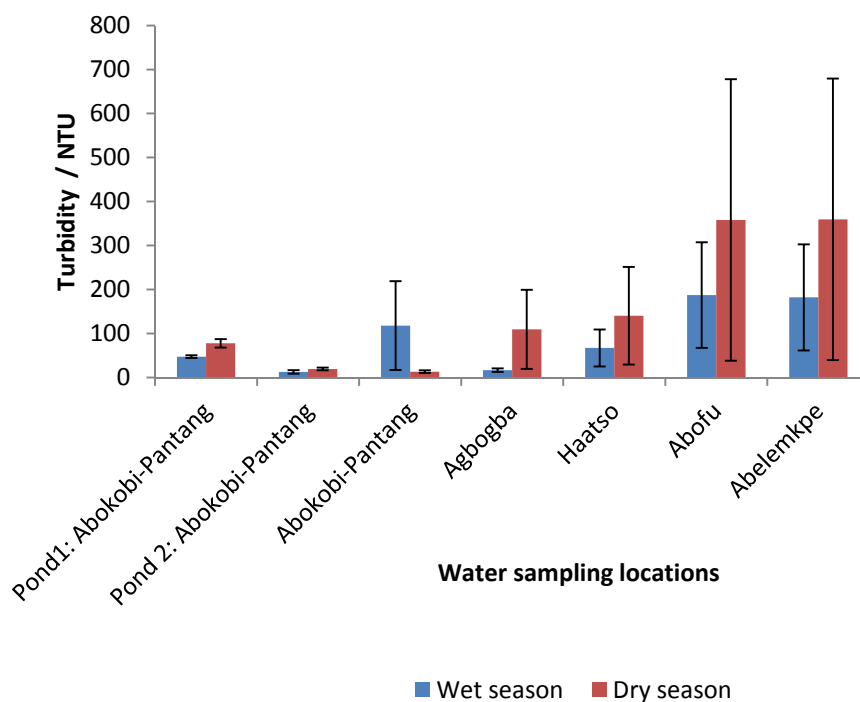


Figure 2 presents the mean temperatures at the selected locations in the Odaw-River catchment. There were no significant differences between the communities in either the *wet season or the dry season* ($P > 0.05$) (Appendix 5.2 and 5.3). Mean temperatures of the water were within natural limits for biological activity.

Figure 3: Mean water turbidity at selected locations



In the *wet season*, the water turbidity (Figure 3) observed at Abokobi-Pantang could be explained by erosion due to the presence of an untarred road (Chapman, 1992) (see

observations from field trip, Appendix 5.5) which was under reconstruction at the time of the investigation as well as farming activities. In the *wet season*, though water speed was quite fast at Agbogba, presence of vegetation in the water might have reduced the turbidity. According to the EPA (EPA, 2000) standards, severe aesthetic effects (appearance, taste and odour) are likely to occur for values above 10 NTU.

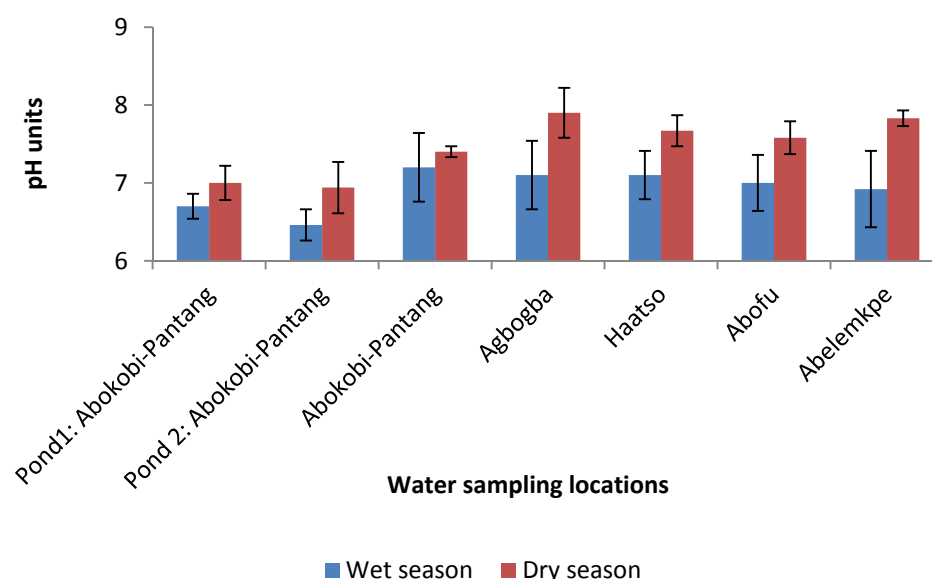
In *both wet and dry seasons*, the mean turbidity of the water sources was relatively lower at Abokobi-Pantang than at Abofu and Abelemkpe (also the highest values). This shows the deterioration that occurs in the water as it flows further into the city where there is exposure of earth from city. Apart from buildings, roads and pedestrian walkways, the city soil is largely exposed. Further, construction activities equally contribute to turbidity.

Acidity (pH)

Figure 4 presents the mean pH of the water at the selected locations. In the *dry season*, mean pH of the water at Haatso was significantly higher than at pond 2 at Abokobi-Pantang ($P < 0.05$). In the *dry season*, the mean pH of the water at Abelemkpe was significantly higher than the mean pH of the water of pond 1: Abokobi-Pantang ($P < 0.05$) and pond 2: Abokobi-Pantang ($P < 0.05$) (Appendix 5.4). This is explained by the fact that both ponds 1 and 2: Abokobi-Pantang was free from wastewater effects. The basis for the comparison between the river and the two ponds is that all are used by the people of Abokobi-Pantang for various activities (as indicated above).

In all the ten communities, the mean pH of the water in the *dry season* was relatively higher than in the *wet season* as the volume of water reduced and there was less dilution from rainfall. Further, from Agbogba towards Abelemkpe, there was wastewater intrusion. In both the *wet season and the dry season*, the water showed consistently lower pH at Abokobi-Pantang than at Agbogba, Haatso, Abofu and Abelemkpe.

Figure 4: Mean water pH at selected locations

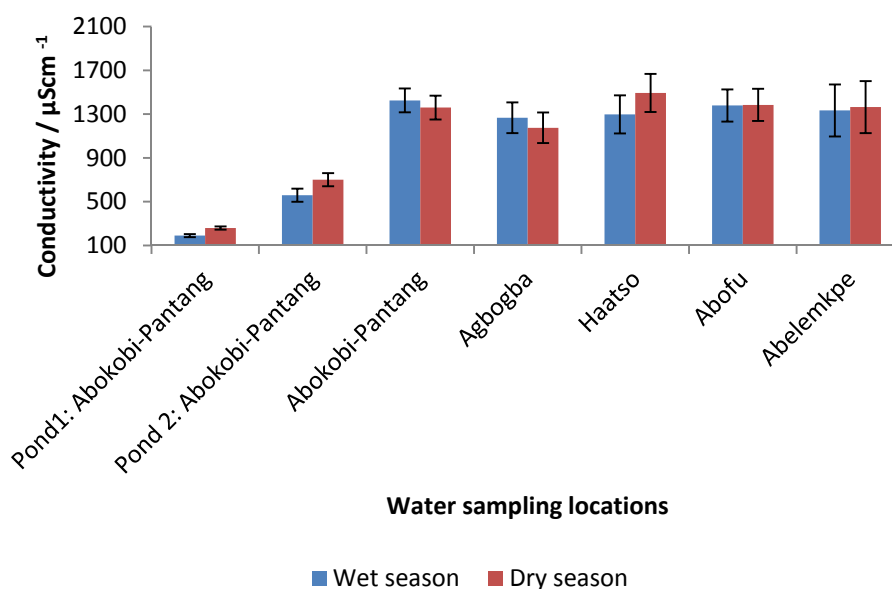


Wastewater and other pollutants increased as the water flowed into the city (Figure 1) and there was possible saline water effects as the water flowed closer to the sea (UNEP and WHO, 1996). The water pH of the samples was largely within natural background concentrations (6.5-8.5).

Conductivity

Figure 5 below presents the mean conductivity of the water at the selected locations. In the *wet season*, mean conductivity of the water at all locations was significantly higher than mean conductivity of the water of pond 1 and 2 at Abokobi-Pantang ($P < 0.05$) (Appendix 5.4). In the *wet season*, the highest conductivity was at Abokobi-Pantang (1425 ± 109) and is explained by the influence from soil erosion.

Figure 5: Water conductivity at selected locations



In the *dry season*, water conductivity of all locations was significantly higher than pond 1, except pond 2 ($P < 0.05$) (Appendix 5.4). Further, mean conductivity of the river (water) at Abokobi-Pantang, Haatso, and Abelemkpe were significantly higher than at pond 2: Abokobi-Pantang ($P < 0.05$) (Appendix 5.4). Pond 2: Abokobi-Pantang had low turbidity in both wet and dry seasons (Figure 3). Indicating the low influence from erosion. The highest conductivity in the dry season was at Haatso (1493 ± 174.2) possibly due to concentration of ions and wastewater discharge from houses.

Whereas underlining rock formations and soil erosion may account for the mean conductivity of the water observed in the river at Abokobi-Pantang and Agbogba, waste discharge from human activities or houses will account for the water conductivity from Haatso to Abelemkpe. Waters that are close to the sea may also receive sea sprays and saline water intrusion (UNEP and WHO, 1996).

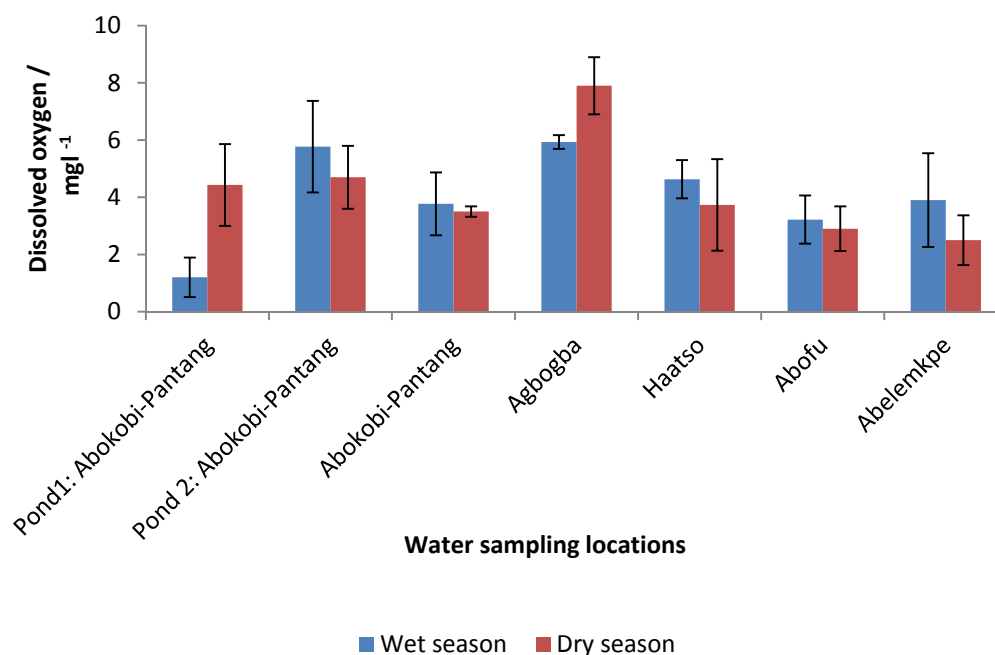
Moyo (1997) observed that high conductivity of water was observed at points of effluent discharge, supported also by Chapman (1992). Ansa-Asare and Asante (2000) also reported that evapotranspiration can have a resultant effect on the rise of water conductivity in the dry season. According to EPA (EPA, 2000 standards, raw water has a noticeably salty taste which is well tolerated for conductivity ranging from 700-1500 μScm^{-1}).

Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand

Dissolved oxygen

The Figure 6 presents the mean dissolved oxygen of the water for the wet and dry seasons in the selected communities.

Figure 6: Mean dissolved oxygen of water at selected locations



In the *wet season*, mean dissolved oxygen of water at pond 2: Abokobi-Pantang, Agbogba and Haatso were significantly higher than Pond 1-Abokbi-Pantang ($P < 0.05$). There is an untarred road that runs near pond 1, runoff carry silt and organic waste from the surroundings to the river and makes it turbid (Figure 3) with a consequent reduction in dissolved oxygen levels (1.2 ± 0.69) in the *wet season*. It was observed during field work that community members used pond 2 more regularly and diversely than pond 1: Abokobi-Pantang. Pond 2: Abokobi-Pantang had vegetation completely surrounding, was away from any road and thus lowering the influence of sediments and influx of substances (in the *wet season*) likely to induce organic decay which consumes oxygen (see also field observations; Appendix 5.5). The section of the river at Abokobi-Pantang flowed slowly in both *the wet season* and the *dry season* and therefore means dissolved oxygen of the water in the wet season (3.77 ± 1.1) was similar to the dry season (3.5 ± 0.18).

The high mean dissolved oxygen of the water at Agbogba during both the *wet season* (5.93 ± 0.024) and the *dry season* (7.9 ± 1.0) could be attributed to the relatively fast speeds which the water flowed and also the relatively limited influence from wastewater from houses. In the *dry season* mean dissolved oxygen of the water at Agbogba was significantly higher than dissolved oxygen at pond 1: Abokobi-Pantang, Haatso, Abofu, and Abelemkpe ($P < 0.05$) (Appendix 5.4). Water flowed with relatively limited wastewater intrusion in Agbogba.

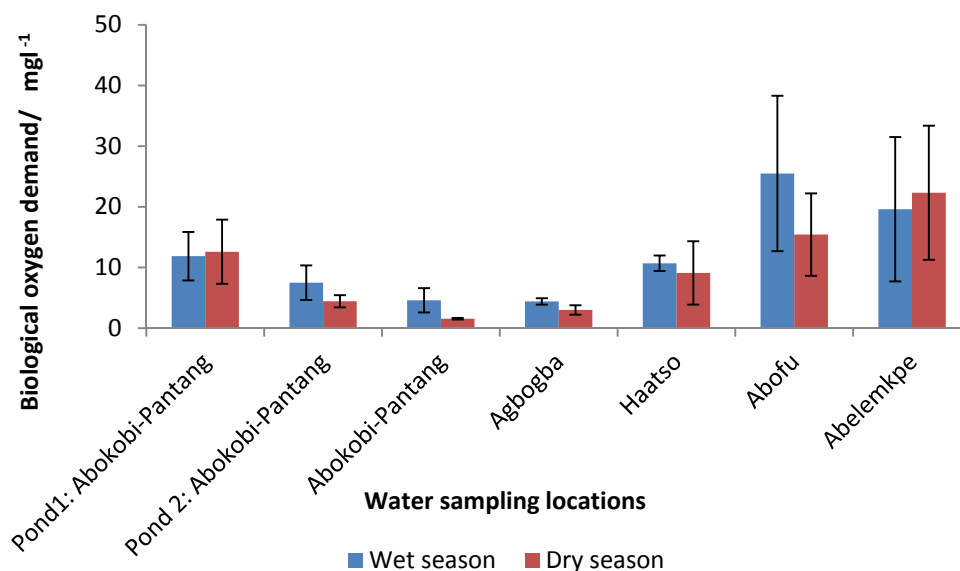
The mean dissolved oxygen of the water at Haatso (3.73 ± 1.63) was relatively higher than at Abofu (2.9 ± 0.78) and Abelemkpe (2.5 ± 0.87) in the *dry season*. The effect of wastewater is more evident in the *dry season* when the dilution from rainfall is reduced. In general, mean dissolved oxygen in the water was higher in the wet season as compared to the dry season due to the effect of aeration (from fast flow) and dilution from rainfall. In general, recommended mean dissolved oxygen of water for maintaining life in aquatic systems is 5mg l^{-1} (Todd, 1970; Ansa-Asare and Asante, 2000).

Biological oxygen demand

The relationship between dissolved oxygen and biological oxygen demand is such that low dissolved oxygen of water corresponds with high biological oxygen demand (BOD₅) as presented in Figure 7. In the *wet season*, the mean biological oxygen demand of pond 1: Abokobi-Pantang (11.87 ± 4) was higher than biological oxygen demand of pond 2 (7.5 ± 2.5) which is consistent with the mean dissolved oxygen of water observed at these two ponds (Figure 6).

In the same vein, mean biological oxygen demand of the water at Agbogba in the *wet season* (4.4 ± 0.5) and the *dry season* (3 ± 0.77) was relatively lower than values recorded at Haatso, Abofu, and Abelemkpe (Figure 7). This is consistent with the levels of mean dissolved oxygen of the water which were relatively lower at these locations (Figure 6), especially in the dry season and the influence of organic waste from waste water [which may contain human waste from houses as well as from open defecation and intentional disposal into the river and its surroundings (see faecal coliform levels on Figure 11)].

Figure 7: Mean biological oxygen demand of water at selected locations



In the *dry season*, mean biological oxygen demand of the water at Abelemkpe was significantly higher than pond 2: Abokobi-Pantang, river at Abokobi-Pantang, and Agbogba ($P < 0.05$) (Appendix 5.4). This is already explained. In general, biological oxygen demand was relatively higher in the wet season as organic waste was washed from the surroundings into the river.

Chemical oxygen demand

Figure 8: Mean chemical oxygen demand at selected locations

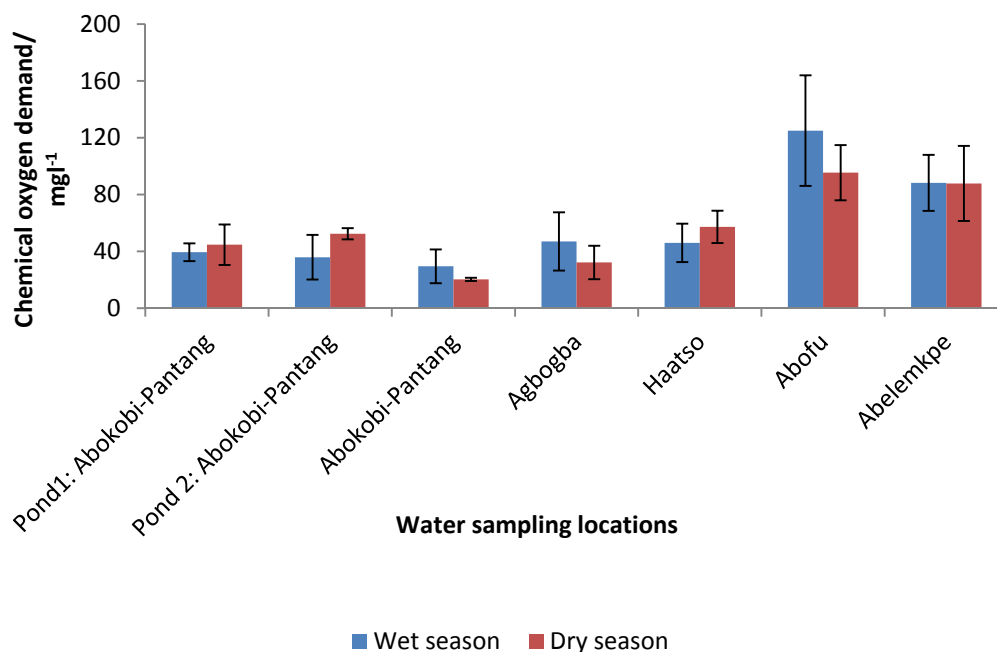
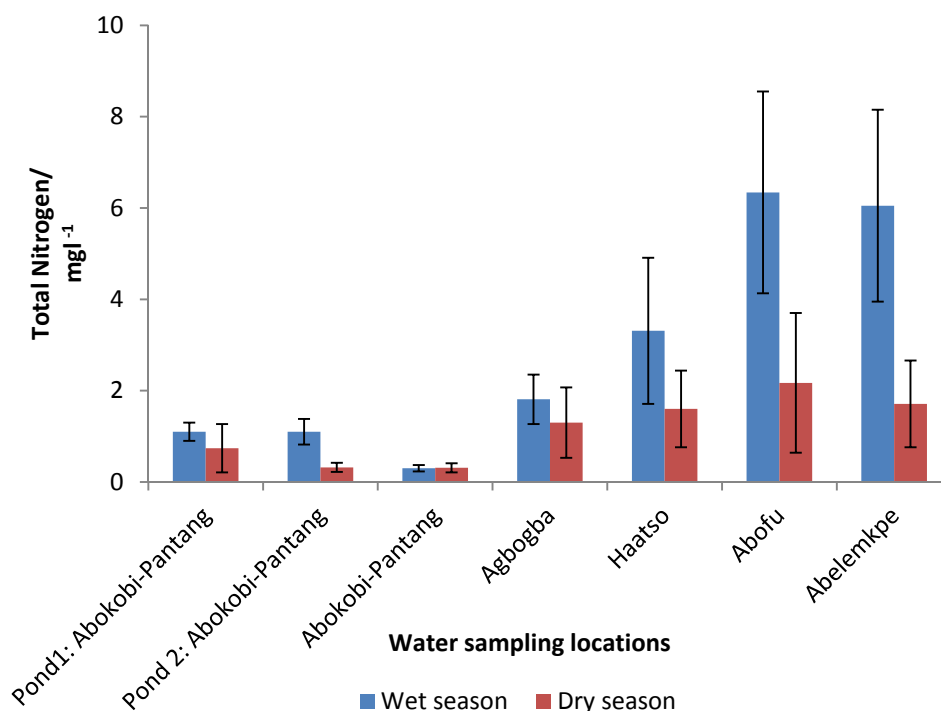


Figure 8 presents the mean chemical oxygen demand of the water at the selected locations. The pattern in Figure 8 agrees with the pattern in Figure 7. In the *wet season*, the mean chemical oxygen demand of pond 1: Abokobi-Pantang (39.4 ± 6.2) was higher than pond 2 (35.9 ± 15.7). In the *wet season*, mean chemical oxygen demand at Abofu was significantly higher than at all locations except Abelemkpe ($P < 0.05$) (Appendix 5.4).

In the *dry season*, mean chemical oxygen demand at Abofu was significantly higher than mean chemical oxygen demand of the water at pond 1: Abokobi-Pantang, the river at Abokobi-Pantang and Agbogba ($P < 0.05$) (Appendix 5.4). The mean chemical oxygen demand of the water at Abelemkpe was significantly higher than that of the river at Abokobi-Pantang and Agbogba ($P < 0.05$) (Appendix 5.1). This is consistent with the water BOD for Abofu and Abelemkpe (which showed that they are most polluted with organic waste).

Total Nitrogen and Total Phosphate

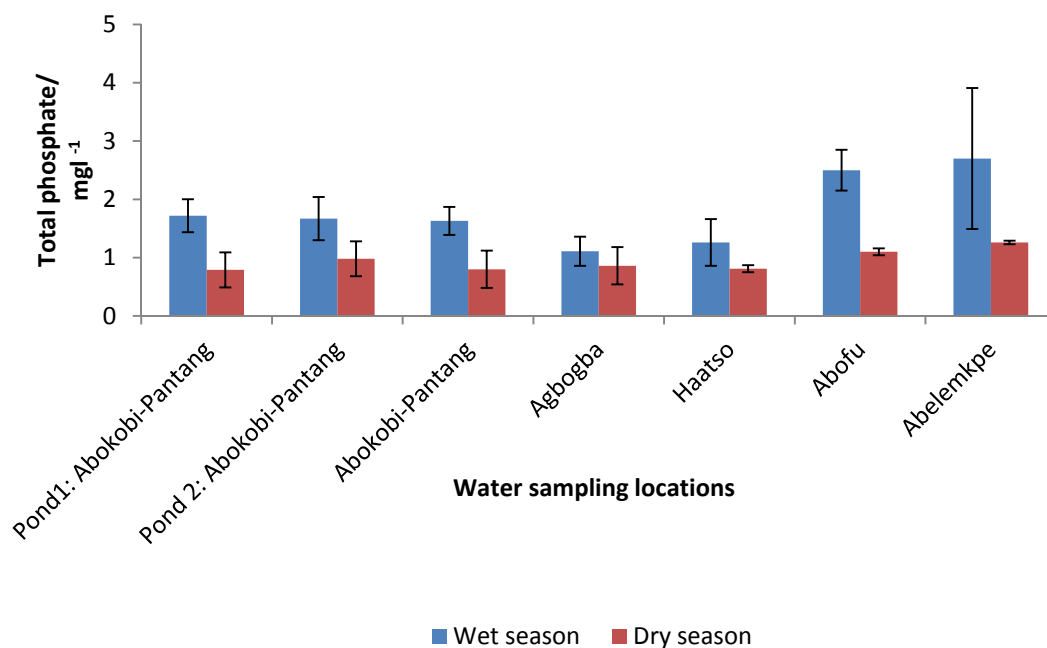
Figure 9: Mean Total Nitrogen of water at selected locations



In the *wet season* mean total nitrogen of the water in pond 1 (1.1 ± 0.2) and pond 2 (1.1 ± 0.28): Abokobi-Pantang was similar. In the *wet season*, the mean total nitrogen of the river was relatively lower at Abokobi-Pantang (0.3 ± 0.07) than at Agbogba (1.81 ± 0.54), Haatso (3.31 ± 1.6), Abofu (6.34 ± 2.21) and Abelemkpe (6.05 ± 2.1). In the *wet season*, mean total nitrogen at Abofu and Abelemkpe were significantly higher than mean total nitrogen of the water in pond 1 at Abokobi-Pantang, pond 2: Abokobi-Pantang; river at Abokobi-Pantang and at Agbogba ($P < 0.05$) (Appendix 5.4). The pattern of mean nitrogen levels also agrees with the pattern of organic substance presence in the water (Figures 7 and 8). This has been explained by the organic load washed from the surroundings during the wet season.

In the dry season, the mean total nitrogen of the water was lower, but still was relatively lower at Agbogba than at Abofu (Figure 9) where wastewater influx from houses increased. Wastewater in urban Accra may sometimes contain human waste linked with the incidence of direct open defecation into drains, for example, at Abofu and Abelemkpe. In general nitrate levels in the samples were low due to the absence of farm lands using fertilisers, absence of a wastewater treatment plant along the course or waste from animal farms. Excess nitrate results in hygienic problems (Wild, 1996).

Figure 10: Mean total phosphate of water at selected locations

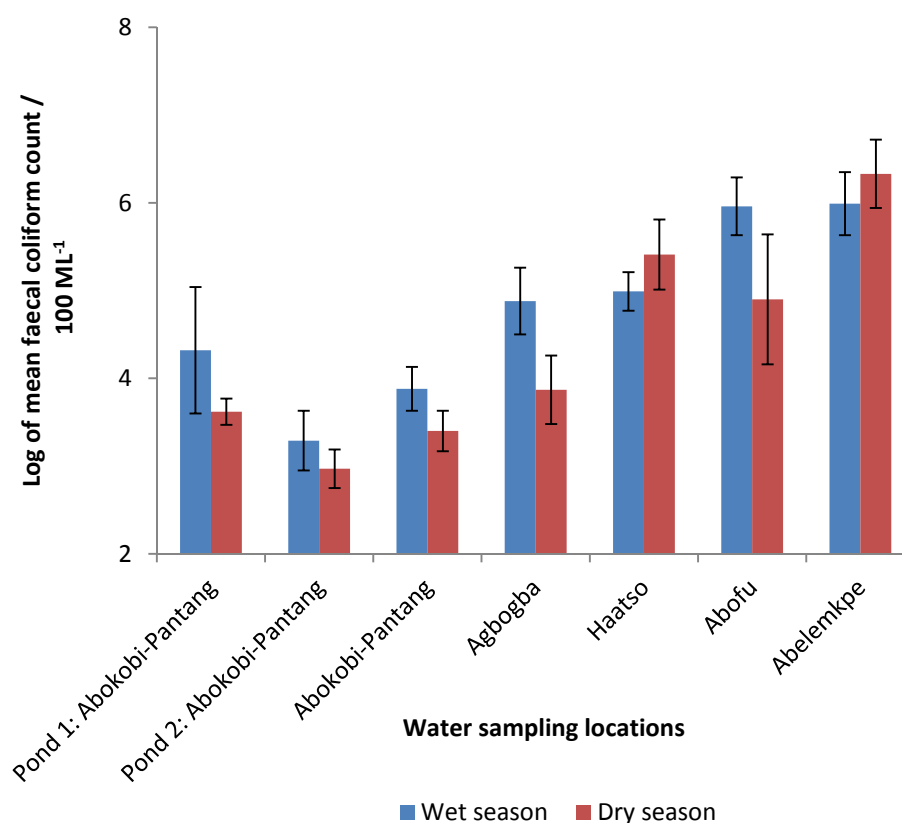


In the *wet season*, mean total phosphate (Figure 10) of the water in pond 1: Abokobi-Pantang (1.72 ± 0.283), pond 2: Abokobi-Pantang (1.67 ± 0.37) and the river at Abokobi-Pantang (1.63 ± 0.24) were similar. The pattern of the total phosphate was such that the levels were relatively lower at Agbogba (1.11 ± 0.25) and Haatso (1.26 ± 0.4), than at Abofu ($2.5 \pm 0.35 \text{ mg l}^{-1}$) and Abelemkpe (2.7 ± 1.21). This pattern agrees with the nitrogen levels (Figure 9).

A similar pattern of mean total phosphate of the water in the wet season was observed in the dry season (Figure 10). A typical concentration of phosphates in drainage water from soils is usually very low, even where phosphate fertilizers have been used. Typical concentrations in unpolluted freshwaters are about 0.06 mg l^{-1} (Wild, 1995). Whereas possible livestock waste in Abokobi-Pantang may have influenced ponds 1: Abokobi-Pantang and Pond 2: Abokobi-Pantang, wastewater intrusion from Agbogba to Abelemkpe explains the phosphate levels observed.

Faecal coliforms

Figure 11: Mean water faecal coliform counts at selected locations



The faecal coliform counts of the water (3.28 ± 0.34 log units /100 ML) indicated that pond 2: Abokobi-Pantang was of the highest microbial quality in the samples in the *wet season*. In the *wet season*, the faecal coliform counts of the river (water) was relatively lower at Abokobi-Pantang (3.88 ± 0.25 log units /100 ML) than at Agbogba (4.88 ± 0.38 log units /100ML), Haatso (4.99 ± 0.22 log units /100 ML), Abofu (5.96 ± 0.33 log units /100 ML) and Abelemkpe (5.99 ± 0.36 log units/ 100 ML). In the wet season mean faecal coliform counts of the river at Abelemkpe were significantly higher than mean faecal coliform counts of the water in pond 1: Abokobi-Pantang and pond 2 : Abokobi-Pantang and the river at Abokobi-Pantang ($P < 0.05$) (Appendix 5.4). This is in line with observation in Abokobi-Pantang, that open defecation and wastewater intrusion was far removed from sources of water in the community.

A similar pattern in mean faecal coliform counts of the water in the *wet season* was observed in the *dry season* (Figure 11). The slightly higher faecal coliform counts of the water at Haatso and Abelemkpe (Figure 11) in the *dry season* could be due to the regular inflow of wastewater from houses possibly containing human waste. In the dry season, mean faecal coliform counts of the water at Haatso, Abofu and Abelemkpe were significantly higher than faecal coliform counts of pond 1: Abokobi-Pantang, pond 2: Abokobi-Pantang and the river at Abokobi-Pantang.

In general, for the majority of the locations, the mean faecal coliform counts of the water in the wet season were higher than in the dry season, suggesting possible influence from the environment as human waste was washed from surroundings by runoff into the river and ponds. The fact remains that water quality deteriorates as one move from Abokobi-Pantang to Abelemkpe. Coliforms occur in both normal and

abnormal human and animal faeces. It is from this point that they contaminate other sites (Stokes and Ridgway, 1987).

The above results show that seasonal differences exist in water quality between the locations. Pond 1 in general was of a higher quality than the river. Human waste is washed from the surroundings into the river during the wet season. Wastewater intrusion keeps biological oxygen demand, chemical oxygen demand, and faecal coliform counts high in the dry season from Agbogba to Abelemkpe. Therefore the water quality, in general deteriorates as it flows from Abokobi-Pantang to Abelemkpe. The quality of the river and the ponds in Abokobi-Pantang suggest caution for use in any domestic activities to avoid infections.

APPENDIX 5.2. ANALYSIS OF VARIANCE FOR WET SEASON FOR WATER QUALITY PARAMETERS

Parameter		Sum of Squares	df	Mean Square	F	Sig.
Faecal column	Between Groups	18.501	6	3.083	6.375	.002
	Within Groups	6.771	14	.484		
	Total	25.272	20			
Conductivity	Between Groups	4251707.238	6	708617.873	11.475	.000
	Within Groups	864538.000	14	61752.714		
	Total	5116245.238	20			
Acidity	Between Groups	1.221	6	.203	.520	.784
	Within Groups	5.478	14	.391		
	Total	6.699	20			
Temperature	Between Groups	4.432	6	.739	.274	.940
	Within Groups	37.760	14	2.697		
	Total	42.192	20			
Turbidity	Between Groups	97247.263	6	16207.877	.922	.508
	Within Groups	246021.907	14	17572.993		
	Total	343269.170	20			
Biological oxygen demand	Between Groups	1122.892	6	187.149	1.306	.317
	Within Groups	2006.433	14	143.317		
	Total	3129.326	20			
Dissolved oxygen	Between Groups	47.751	6	7.959	2.276	.096
	Within Groups	48.960	14	3.497		
	Total	96.711	20			
Chemical oxygen demand	Between Groups	21857.092	6	3642.849	2.897	.047
	Within Groups	17605.080	14	1257.506		
	Total	39462.172	20			
Total Nitrogen	Between Groups	109.127	6	18.188	3.413	.027
	Within Groups	74.605	14	5.329		
	Total	183.731	20			
Total	Between Groups	6.453	6	1.076	1.207	.359

Phosphate	Within Groups	12.479	14	.891		
	Total	18.932	20			

APPENDIX 5.3 ANOVA FOR DRY SEASON PARAMETERS

Parameter		Sum of squares	df	Mean square	F	Sig
Faecal column	Between Groups	26.755	6	4.459	9.242	.000
	Within Groups	6.755	14	.482		
	Total	33.509	20			
Conductivity	Between Groups	3733845.905	6	622307.651	7.016	.001
	Within Groups	1241777.333	14	88698.381		
	Total	4975623.238	20			
Acidity	Between Groups	2.566	6	.428	2.764	.055
	Within Groups	2.166	14	.155		
	Total	4.732	20			
Temperature	Between Groups	6.373	6	1.062	.456	.829
	Within Groups	32.607	14	2.329		
	Total	38.980	20			
Turbidity	Between Groups	389768.292	6	64961.382	.670	.675
	Within Groups	1356490.700	14	96892.193		
	Total	1746258.992	20			
Biological O D	Between Groups	1027.762	6	171.294	1.777	.176
	Within Groups	1349.236	14	96.374		
	Total	2376.998	20			
Dissolved O	Between Groups	57.293	6	9.549	2.680	.060
	Within Groups	49.873	14	3.562		
	Total	107.167	20			
Chemical OD	Between	13641.800	6	2273.633	3.386	.028

	Groups					
	Within Groups	9401.167	14	671.512		
	Total	23042.967	20			
Total Nitrogen	Between Groups	9.369	6	1.561	.752	.618
	Within Groups	29.068	14	2.076		
	Total	38.437	20			
Total Phosphate	Between Groups	.564	6	.094	.507	.793
	Within Groups	2.597	14	.185		
	Total	3.160	20			

APPENDIX 5.4 MULTIPLE COMPARISONS FOR WATER QUALITY PARAMETERS

Dry season

Mean pH of the water at Haatso was significantly higher than at pond 2 at Abokobi-Pantang {mean difference (95% C.I): 0.73333(0.0445 to .1.4221), P=0.039}

Mean pH of the water at Abelemkpe was significantly higher than mean pH of the water of pond 1 {mean difference (95% C.I): 0.8033(0.1145 to 1.4921), P=0.025)} and pond 2 {mean difference (95% C.I): 0.89 (0.2012 to 1.579), P=0.015)} at Abokobi-Pantang

CONDUCTIVITY

Wet season

In the wet season, water conductivity of all locations were significantly higher than pond 1 Abokobi-Pantang, except pond 2: Abokobi-Pantang

Sampling location	Mean difference	95% C.I	P-value
River: Abokobi-Pantang	1235.3333	800.1558 to 1670.5	0.000
River : Agbogba	1076.67	641.5 to 1511.8	0.000
Haatso	1108.00	672.80 to 1543.2	0.000
Abofu	1189.00	753.8 to 1624.2	0.000
Abelemkpe	1143.7	708.49 to 1578.8	0.000

In the wet season, water conductivity of all locations were significantly higher than pond 2 Abokobi-Pantang, except pond 1; Abokobi-Pantang

Sampling location	Mean difference	95% C.I	P-value
Dakobi (Abokobi-Pantang)	866.33	431.16 to 1301.5	0.001
Agbogba	707.7	272.49 to 1142.844	0.004
Haatso	739	303.8 to 1174.20	0.003
Abofu	820	384.82 to 1255.20	0.001
Abelemkpe	774.70	339.5 to 1209.84	0.002

Dry Season

In the dry season, water conductivity of all locations were significantly higher than pond 1: Abokobi-Pantang, except pond 2: Abokobi-Pantang

Sampling location	Mean difference	95% C.I	P-value
Dakobi (Abokobi-Pantang)	1101.67	580.11 to 1623.21	0.000
Agbogba	916.33	394.78 to 1437.90	0.002
HAA (Haatso)	1234.33	712.78 to 1755.90	0.001
ABF (Abofu)	1125.33	603.78 to 1646.90	0.000
ABK (Abelemkpe)	1105	583.45 to 1626.55	0.016

In the dry season, river at Abokobi-Pantang, Haatso, Abofu, and Abelemkpe: were significantly higher than pond 2, Abokobi-Pantang:

Sampling location	Mean difference	95% C.I	P-value
River: Abokobi-Pantang	659.00	137.45 to 1180.55	0.017
Haatso	791.67	270.11 to 1313.22	0.006
Abofu	682.67	161.11 to 1204.21	0.014
Abelemkpe	662.33	140.78 to 1183.90	0.016

DISSOLVED OXYGEN

Wet season

In the wet season, the water dissolved oxygen at pond 2, Abokobi-Pantang; river at Agbogba: and river at Haatso, were significantly higher than water dissolved oxygen at pond 1, Abokobi-Pantang

Sampling location	Mean difference	95% C.I	P-value
Pond2, Abokobi-Pantang	4.6	1.33 to 7.87	0.009
Agbogba	4.77	1.49 to 8.04	0.008
Haatso	3.45	0.192 to 6.74	0.04

Dry season

In the dry season water dissolved oxygen at Agbogba was significantly higher than water dissolved oxygen at: pond 1, Abokobi-Pantang; river at Abokobi-Pantang; river at Haatso; river at Abofu and river at Abelemkpe:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	3.43	0.1281 to 6.7386	0.043
River, Abokobi-Pantang	4.33	1.0281 to 7.6386	0.014
Haatso	4.133	0.8281 to 7.4386	0.018
Abofu	4.97	1.6614 to 8.2719	0.006
Abokobi-Pantang	5.4	2.0947 to 8.7053	0.004

BIOLOGICAL OXYGEN DEMAND

Wet season

There were no significant differences between the biological oxygen demand between the communities in the wet season.

Dry season

In the dry season water biological oxygen demand at Abelemkpe was significantly higher than that of pond 2, Abokobi-Pantang; river at Abokobi-Pantang, and river at Agbogba:

Sampling location	Mean difference	95% C.I	P-value
Pond 2, Abokobi-Pantang	17.9	0.7083 to 35.092	0.042
River, Abokobi-Pantang	20.79	3.5950 to 37.9783	0.021
River, Agbogba	19.5	2.3083 to 36.6917	0.029

CHEMICAL OXYGEN DEMAND

Wet season

In the wet season water chemical oxygen demand at Abofu was significantly higher than all the locations except Abelemkpe:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	85.6	23.5000 to 147.7003	0.01
Pond 2, Abokobi-Pantang	89.1	26.9997 to 151.2003	0.008
River at Abokobi-Pantang	95.4667	33.3664 to 157.5669	0.005
River at Agbogba	77.3	15.2331 to 139.4336	0.018
River at Haatso	78.6	16.4997 to 140.7003	0.017

Dry season

In the dry season, water chemical oxygen demand at Abofu was significantly higher than at pond 1, Abokobi-Pantang; river at Abokobi-Pantang; and river at Agbogba.

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	50.7	5.3199 to 96.0801	0.031
River, Abokobi-Pantang	75.1	29.7199 to 120.4801	0.003
River, Agbogba	63.13	17.7532 to 108.5134	

In the dry season the chemical oxygen demand at Abelemkpe: ABK was significantly higher than at river at Abokobi-Pantang: D-ABP and river at Agbogba: O-AGB:

Sampling location	Mean difference	95% C.I	P-value
River, Abokobi-Pantang	67.57	22.1866 to 112.9468	0.007
River, Abokobi-Pantang	55.6	10.2199 to 100.9801	0.02

TOTAL NITROGEN

Wet season

In the wet season, the total nitrogen concentration of the water at Abelemkpe was significantly higher than at pond 1, Abokobi-Pantang, pond 2, Abokobi-Pantang; and river at Abokobi-Pantang, and river at Agbogba:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	5.23	1.1831 to 9.2682	0.015
Pond 2, Abokobi-Pantang	5.26	1.2208 to 9.3059	0.014
River, Abokobi-Pantang	6.04	1.9988 to 10.0839	0.006
River, Agbogba	4.53	0.4841 to 8.5692	0.031

Dry season

In the wet season, the total nitrogen concentration of the water at Abelemkpe was significantly higher than that at pond 1, Abokobi-Pantang; pond 2, Abokobi-Pantang, river at Abokobi-Pantang, and river at Agbogba:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	4.94	0.8931 to 8.9782	0.02
Pond 2, Abokobi-Pantang	4.97	0.9308 to 9.0159	0.02
River, Abokobi-Pantang	5.75	1.7088 to 9.7939	0.009
River, Agbogba	4.24	0.1941 to 8.2792	0.041

TOTAL PHOSPHATE

There was no significant difference between the communities in the wet and dry season.

FAECAL CLOIFORM COUNTS

Wet season

In the wet season the water faecal coliform counts at Agbogba and Haatso were significantly higher than at pond 2, Abokobi-Pantang:

In the wet season, water faecal coliform counts of Abelemkpe were significantly higher than pond 1, Abokobi-Pantang, pond 2, Abokobi-Pantang, and river Abokobi-Pantang:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	1.67	0.455 to 2.8912	0.011
Pond 2, Abokobi-Pantang	2.7	1.4855 to 3.9212	0.000
River, Abokobi-Pantang	2.11	0.8955 to 3.3312	0.002

Dry season

In the dry season, water faecal coliform counts at Haatso, was significantly higher than at pond 1, Abokobi-Pantang, Pond 2: Abokobi-Pantang; and river at Abokobi-Pantang, and river, Agbogba

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	1.79	0.5703 to 3.0031	0.007
Pond 2, Abokobi-Pantang	2.44	1.2236 to 3.6564	0.001
River, Abokobi-Pantang	2.01	0.7903 to 3.2231	0.003
O-AGB	1.54	0.3203 to 2.7531	0.017

In the dry season, water faecal coliform concentration at Abofu was significantly higher than those at pond 1, Abokobi-Pantang; pond 2, Abokobi-Pantang, and river at Abokobi-Pantang:

Sampling location	Mean difference	95% C.I	P-value
Pond 1, Abokobi-Pantang	1.30	0.0869 to 2.5197	0.037
Pond 2, Abokobi-Pantang	1.96	0.7403 to 3.1731	0.004
River, Abokobi-Pantang	1.52	0.3069 to 2.7397	0.018

In the dry season the water faecal coliform counts at Abelemkpe was significantly higher than those at pond 1: Abokobi-Pantang, pond 2, Abokobi-Pantang; and river at Abokobi-Pantang; Agbogba and Abofu:

Sampling location	Mean difference	95% C.I	P-value
Pond 1 , Abokobi-Pantang	2.7	1.4869 to 3.9197	0.000
Pond 2, Abokobi-Pantang	3.36	2.1403 to 4.5731	0.000
River, Abokobi-Pantang	2.92	1.7069 to 4.1397	0.000
Agbogba	2.45	1.2369 to 3.6697	0.001
Abofu	1.4	0.1836 to 2.6164	0.027

APPENDIX 5.5: OBSERVATIONS IN THE FIELD

Observations during Field Trip

Permanent features:

1. Pond 1: Abokobi-Pantang: untarred road by the pond; part of pond surrounded by vegetation
2. Pond 2: Abokobi-Pantang: Pond completely surrounded by vegetation and away from any road
3. River: Abokobi-Pantang: Untarred road (was being reconstructed during field work) across the river; river surrounded by vegetation; farmlands along the river course
4. Agbogba: Untarred road across the river ; residential wastewater discharges into the river; evidence of development on the banks of the river (in some cases , less than 5-10 metres from the river)
5. Haatso: wastewater links to the river; farm lands along river course; mechanic shops along the river, residential development along river course
6. Abofu and Abelemkpe: intensive residential development along river course, wastewater from residential units flow into river,

Temporary features

Sampling location	Observation	
	Wet season	Dry season
Pond 1 Abokobi-Pantang	Pond overflowed and linked with the untarred road; Colour of water was brownish	Volume of water reduced
Pond 2:Abokobi-Pantang	Pond full to its limits	Volume of water reduced
River: Abokobi Pantang	Flowed slowly,	Flowed very slowly, water levels were low
Agbogba	Flow very fast	Flow was moderately fast, water levels were low

Haatso	Flowed very fast	Flow was moderately fast, water levels were low
Abofu	Flowed very fast; evidence of open defecation, evidence of solid waste disposal into the river	Flow was moderately fast , evidence of open defecation and solid waste disposal
Abelemkpe	Flowed very fast, evidence of open defecation, evidence of solid waste disposal into river,	Flow was moderately fast, evidence of open defecation and solid waste disposal

APPENDIX 5.6 SELECTED ENVIRONMENTAL PROTECTION AGENCY OF GHANA RAW WATER QUALITY GUIDELINES

Parameter	EPA-Ghana Guidelines
pH	6.5-8.5
TDS	A slightly salty taste may be detected for values of 450 mg/l-1 A noticeably salty taste is observed for values ranging from 450-1000 mg/l-1
Conductivity	Raw water has a noticeably salty taste which is well tolerated for conductivity values ranging from 700-1500 uScm-1
Turbidity	Severe aesthetic effects (appearance, taste and odour) are likely to occur for turbidity values above 10 NTU

Other guidelines

Parameter	Guidelines
Dissolved oxygen	5 mg/l-1 (adapted from Todd, 1970)
Biochemical oxygen demand	2mg/l-1 (Chapman 1992)
Phosphate	0.06mg/l-1 (Wild, 1995)
Faecal coliform	3 log units (WHO guidelines for unrestricted crop irrigation)

**APPENDIX 5.7 CORRELATION BETWEEN ATTITUDE STATEMENTS AND
SELECTED SOCIO-ECONOMIC FACTORS**

Overall population

Q	Total formal occupation	Total informal occupation	Socio-economic score 1	Socio-economic score 2	Per capita monthly income	Income	Age	Educational	Years in Accra
1							0.095 P:0.046		
2									
3							0.097 P:0.042		
4	0.123 P:0.009	-0.103 P=0.03				0.171 P:0.000			
5						0.124 P:0.01			
6									
7						0.117 P:0.015			
8									
9	0.142 P=0.003					0.162 P:001			0.121 P:0.11
10		-0.124 P=0.009							
11					-0.109 P:0.022				
12									
13	0.106 P:0.026					0.152 P:0.001			
14		-0.1 P=0.042		0.097 P=0.042					
15									
16									
17									
18						0.11 P:0.02			
19									
20									
21									
22									
23									
24									0.105 P:0.028

High infrastructure provision

Q	Total formal occupation	Total informal occupation	Socio-economic score1	Socio-economic score 2	Per capita monthly income	Income	Age	Education	Years in Accra
1									
2									
3									
4						0.27 P:0.003			
5						0.22 P:0.015			
6	-0.223 P:0.014			0.193 P:0.033	0.203 P:0.025				
7									0.23 P:0.011
8				0.183 P:0.045					
9									
10								0.2 P:0.03	
11									
12									
13									
14				0.208 P:0.021	-				
15									
16									
17									
18									
19									
20									
21									
22									
23						0.231 P:0.011			
24								0.276 P:0.02	0.215 P:0.018

Medium infrastructure provision

Q	Total formal occupation	Total informal occupation	Socio-economic score 1	Socio-economic score 2	Per capita monthly income	Income	Age	Education	Years in Accra
1									
2					0.237 P:0.012	0.207 P:0.029	0.234 P:0.013		
3									-0.238 P:0.013
4				-0.228 P:0.016				0.291 P:0.002	
5									
6							0.192 P:0.043		-0.263 P:0.006
7								0.22 P:0.021	
8									
9									0.37 P:0.000
10									
11									
12									0.323 P:0.001
13									
14									
15									
16					0.227 P:0.016	0.263 P:0.005			-0.234 P:0.015
17									
18									0.196 P:0.042
19									
20									
21								-0.194 P:0.042	
22									
23									-0.22 P:0.025
24									

Low infrastructure provision

Q	Total formal occupation	Total informal occupation	Socio-economic score1	Socio-economic score 2	Per capita monthly income	Income	Age	Education	Years in Accra
1									
2									
3									
4	0.229 P:0.01	-0.254 P=0.004							
5									
6			0.2 P:0.024						
7									
8									
9	0.191 P:0.031					0.314 P:0.000			
10									
11									
12									
13									
14				0.21 P:0.019					
15									
16									
17									
18			0.290 P:0.001						
19									
20									
21									
22									
23							0.193 P:0.031		
24									

APPENDIX 6.1: TIME LINE OF DEVELOPMENT OF LEGISLATION IN THE WATER, SANITATION, ENVIRONMENT AND OTHER SECTORS GHANA

[SOURCE: Fuest et al., 2005]

1928

- Development of the water sector began with a piped system in Cape Coast followed by Accra and other regional capitals – **Public Works Department (PWD)** was responsible for urban and rural water supply in Ghana

1945

- **Department of Town and Country Planning** established. Responsible for designing plans and controlling settlements, based on mapping information by the Survey Department.

1948

- **Rural Water Development Department** was established

1957

- After independence the Ghana **Meteorological Services Department (MSD)** was established under the Ministry of Communications

1958

- **Water Supply Divison** of the Public Works Department (PWD), with its headquarters at Kumasi, became a separate entity responsible to the Ministry of Works and Housing (MWH)

1959

- **Severe water shortage in 1959** - WHO recommended to create an institution like Ghana Water and Sewerage Corporation (GWSC)

1961

- **Volta River Development Act (Act 46)** Founding the VRA, whose primary function is to supply electrical energy for industrial, commercial and domestic use in Ghana.

1962

- **State Lands Act (Act 125)**
- **Volta River Authority (VRA)** established

1965

- **Water Supply Division** under PWD was transformed into **Ghana Water and Sewerage Corporation (GWSC)** (Act 310 of 1965)

1967

- **Volta River Development Act Amendment Decree (N.L.C.D. 211)**

1977

- **Supreme Military Council Decree 85: Irrigation Development Authority Decree (S.M.C.D. 85)**

1981

- Start of the **International Drinking Water Supply and Sanitation Decade (IDWSSD)**

1983

- **Economic Recovery Programme (ERP)**
- **Structural Adjustment Programme (SAP)** – operating time SAP until 1993.

1985

- **Water Aid International** started operations in Ghana.
- **Environmental Action Plan** was prepared

1986

- **Minerals and Mining Law (PNDC Law 153):**

1987

- **Integrated Social Development Centre (ISODEC)** was founded
- **Five Year Rehabilitation and Development Plan** was prepared, to guide implementing the reforms intended by the ERP
- **Water and Sanitation Conference** sponsored by the MWH on behalf of GWSC (September) – Outcome was the Water Sector Rehabilitation Project 1995 (WSRP)
- **Irrigation Development Authority Regulations (L.I. 1350)**

1988

- **Beginning of Decentralisation Policy**
- **Local Government Law (PNDC Law 207)**

1990

- **End of the IDWSSD**
- **Government of Ghana started restructuring the Ghanaian Water Sector.**

1991

- **Legislative Instrument, Local Government (Establishment) Instrument (L.I. 1514)** for the establishment of Urban, Zonal and Town Councils and of Unit Committees.
- **Community Water and Sanitation Programme-1 (CWSP-1)** was adopted at the Kokrobite conference.

1992

- **Fourth Republican Constitution of the Republic of Ghana**
- **University of Development Studies (UDS)** was established

1993

- **Civil Service Law (PNDC Law 327)**
- **Local Government Act (Act 462)**
- **District Assemblies' Common Fund (DACF)** established
- **National Community Water and Sanitation Programme** designed
- **Civil Service Law (PNDC Law 327)**
- **Danish International Development Agency (DANIDA)** started activities in the water supply and sanitation sector in Ghana.
- Close of ERP and SAP
- Ghana Environmental Action Plan (GERMP) became effective

1994

- **Environmental Protection Agency Act (Act 490)**
- Formation of **Environmental Protection Agency (EPA)**
- **Office of the Administrator of Stool Land Act (Act 481)**
- **Minerals and Mining (Amendment) Act (Act 475)**
- **Lands Commission** established
- **Professional Network Associates (ProNet)** was set up.
- **MWH with assistance of WB engaged Halcrow & Partners LTD** to undertake a study and submit proposals for the Restructuring of the Water Sector
- Formation of **Environmental Protection Agency (EPA)**
- **Community Water and Sanitation Division (CWSD)** established within GWSC
- Concept of “**Water Resources Management**” of the **World Bank (WB)** was introduced to the Ghanaian rural water sector through CWSP-1
- Launch of **National Forest and Wildlife Policy**

1995

- **Local Government (Accra Metropolitan Assembly) Establishment Instrument (L.I.1615)**
- **Association of Water and Sanitation Development Boards (AWSDB)** was established.
- **Water Sector Rehabilitation Project (WSRP)**
Mandate: rehabilitation of 34 urban water supply systems. Funds: GoG, GWSC (now: GWCL) and Donors. Intention: inter alia, increasing of Private Sector Participation (PSP); followed by the SIP. Operating time until 1998.
- **National workshop in February:** Halcrow Consultants considered recommendations for the restructuring of water sector

1996

- **Council for Scientific and Industrial Research (CSIR)** re-established under Act 521
- **Water Resources Commission Act (WRC Act 522)** passed
- **Water Research Institute (WRI)** established.
- **Gesellschaft für Technische Zusammenarbeit (GTZ)** started to give technical support to the CWSA
- **Water Resources Management Study (WRMS):**
1996-1998. Objectives: promotion and facilitation of cross-sectoral management of water resources and development of a water resources management strategy that will inform national policy and investment in the water sector.
- **Forestry Development Master Plan** (planned for 1996-2020) for guiding the implementation of the National Forest and Wildlife Policy (1994)

1997

- **Public Utilities Regulatory Commission Act (PURC Act 538)**
- **Water Sector Restructuring Secretariat (WSRS)** created to guide the PSP process.
- **First Medium-Term Development Plan of Ghana Vision 2020** (until 2000)

1998

- **Community Water and Sanitation Agency Act (CWSA Act 564)**
- **Strategic Investment Programme (SIP)** prepared as an update to the 1993 NCWSP, the targets being adapted in the process, taking into account the MDGs (ADF 2003:7-8).
- **National Society of Black Engineers-Student chapter of Kwame Nkrumah University of Science and Technology (NSBE-KNUST)** formed under Ghana Institution of Engineers (GhIE)

- **First International Conference of NSBE in Ghana**
- **Formation of the WRC**

1999

- **Environmental Assessment Regulations (L.I. 1652)**
- **Northern Region Water and Sanitation Project (NORWASP) started.**
- **Forestry Commission Act (Act 571)**
- **Ghana Water Company Limited (GWCL) established.**
- **Second international Conference of NSBE in Ghana**
- **Community Water and Sanitation Programme-2 (CWSP-2) started.**
- **WRC became operational.**
- **Launch of Natural Resource Management Programme (NRMP)**

2000

- **The 2nd phase of the Forest Sector Development Project (FSDP-2) commenced by Forestry Commission under the Natural Resource Management Programme (NRMP) – the Government’s major vehicle for implementing sector policies, which is led by the Ministry of Lands and Forestry (MLF).**
- **Close of First Medium-Term Development Plan of Ghana Vision 2020**

2001

- **Water Use Regulations (LI 1692) adopted**

2003

- **Ghana Poverty Reduction Strategy Programme approved**
- **Public Procurement Act passed**

2004

- **Local Government Service Act** passed in January 2004
- **Ghana Meteorological Agency Act** passed in December 2004

Fuest, V., Ampomah, B., Haffner, S.A., Tweneboah, E. (2005). Mapping the Water Sector of Ghana. An Inventory of Institutions and Actors. Centre for Development Research (ZEF), University of Bonn. The GLOWA Project. 64p.