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Overview of WASH sector
application for GAMA



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the Institute for Integrated Economic
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Overview of Water and Sanitation Sector Application for GAMA city-region

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1. Document Overview

The document provides an overview of the water and sanitation sector (WASH), in the context of the Greater Accra Metropolitan Area (GAMA), as the sector application of the Future Cities Africa (FCA) Decision-Making model prototype development. The sector was selected at a workshop on the 24th of March 2015 in Accra together with 78 invited local stakeholders. The scope, data requirements, availability and gaps, institutions and possible technical, policy and planning interventions for the WASH sector were further refined during a technical experts group meeting held at ILGS, GAMA on the 26th March 2015.

The outline includes an overview of:

- The aims of the sector application (section 2)
- The WASH sector description in the context of the GAMA (section 3)
- An overview of the baseline situation (section 4 – TBD)
- A set of preliminary decision interventions for the application (section 5)
- A set of preliminary data requirements and institutional sources (section 6)

The document will be periodically updated during the prototyping project based on local stakeholder inputs and on-going project research into the WASH sector.

The prototype is part of a 5 year development trajectory with three phases. The second phase aim after prototype development is to scale model logic to a full economy model covering all sectors. In the third phase testing and validation in multiple country locations is to be carried out, after which the model release free at end use is planned.

2. Sector Application Aim

The prototype sector application serves as part of testing model logic and functionality to ensure quality and validity of model prototype algorithms.

In relation to the GAMA city-region the sector application is to provide for:

- The collection, harmonization, and integration of existing datasets including land use, WASH infrastructure, population plus household data, and WASH sector flows including supply and demand. These will form a series of layered datasets for prototype use and a standalone open source of data to be made available locally.
- The representation of water treatment and sanitation infrastructure in the model for a part of the GAMA city-region based on available datasets.
- A demonstration of functionality of the prototype in 1st/2nd quarter 2016 for GAMA based on a set of WASH sector policy and technology decision options, so as to create insights on their impacts at economic, social, and environmental dimensions over a 5-20 year time-period.

3. WASH Sector Description

The delivery of clean water is essential for human societies to flourish. Water supply covers the collection and treatment of water to desirable qualities for residential, agricultural, industrial, or other commercial uses. A key element in the supply of water is its quality being free from harmful or undesirable biological, chemical, or physical compounds and organisms. To ensure the quality of water the prevention of any contact of human wastes with water systems is essential. The collection of human excreta can be exercised by putting in place appropriate sanitation systems in households and communities, as well as subsequent treatment facilities.

The WASH sector can be described by six types of process systems:

- **Source water collection**, as the collection and extraction of raw water from the environment. Sources can include rainwater, groundwater sources, wells, and surface sources such as rivers, lakes, streams, estuaries, and coastal shorelines.
- **Source water treatment**, the removal of pathogens, suspended particles and other impurities in water sources. The treatment type depends on source quality and the desired quality of the finished water (e.g. drinking water).

- **Water distribution**, the infrastructure required to transfer water from a treatment facility across networks for use including residential, agricultural, commercial and industrial use, and to collect it as waste water for treatment.
- **Sanitation collection**, the toilet discharge and collection systems of human excreta from households, communities, businesses, and commercial sites.
- **Waste water treatment**, the treatment and resource recovery of water that has been used and discharged from homes, businesses, cities, and industry, which can include human excreta wastes.
- **Sanitation treatment systems**, the treatment and resource recovery of human excreta in facilities outside of the water system, such as biogas and slurry production systems.

In the context of GAMA also solid waste generation and disposal is closely related to the functioning of WASH systems, because of the use of open drains which can become clogged with solid wastes. The influence of this factor can be described by two additional process systems, in the **collection of solid wastes**, and the **disposal and/or recycling treatment** at waste facility sites.

3.1 WASH challenges in GAMA

The functioning of the WASH sector can be conceptualised at baseline from the water systems, sanitation systems, and the influence of the household solid waste systems on the function of WASH system. These systems should live up to the task of providing basic sanitation services, universal access to safe drinking water, and the ability to deal with rainfall/storm water. However, at present the infrastructure in place in GAMA is inadequate in its functioning of these tasks. This poses a number of challenges to the city-region with substantive implications for people's livelihoods, as listed below and depicted schematically in figure 1 at the end.

Because of the infrastructure inadequacy the city-region is coping with a number of challenges, of which the most important include:

- **Chocked open drains**, the open drains in the city are often blocked with wastes in parts of the city-region, resulting in over-flooding in periods with significant rainfall.
- **Water quality**, the quality levels of surface water is poor in many areas due to fecal coliform contamination, among other impurities, as a cause of direct source contamination as well as environmental discharge, given the limited number of WASH treatment systems in place or in operation
- **Flooding**, the occasional flooding in periods of excessive rainfall due to clogging of open drains with solid wastes in a number of areas, and inadequate catchment in a few areas relative to the magnitude of rainfall.
- **Environmental pollution**, the large portion of excreta, waste water, and solid waste which is discharged directly into the environment, affecting the functioning of these ecosystems.
- **Water service reliability**, the reliability of water access is sporadic at times, where certain areas are only serviced once per week or less.

The combination of these challenges and their interaction results in a number of implications on the city-region's population, which includes:

- **Water borne diseases**, the lack of water quality impacts disease frequency, especially Cholera, which causes loss of life, sickness days, and reduced productivity.

- **Flooding damage**, the occasional flooding leads to damage on community property, in the form of damaged infrastructure as well as impairment of social and business activities.
- **Environmental costs**, the dumping of sanitation, waste water, and solid waste into the environment impairs the overall functioning due to which ecosystem states change. The beauty of the environment is impaired, and species carrying capacity is reduced, such as for fish, removing a source of income and the ability for people to sustain their livelihoods.
- **Financial means to sustain livelihoods**, the cost of sickness, loss of productivity, and flooding damages impacts the ability of affected people to gain the income to sustain their livelihoods.
- **Social upheaval**, the inability of appropriate responses to these challenges results in discontent, distress, and social upheaval.

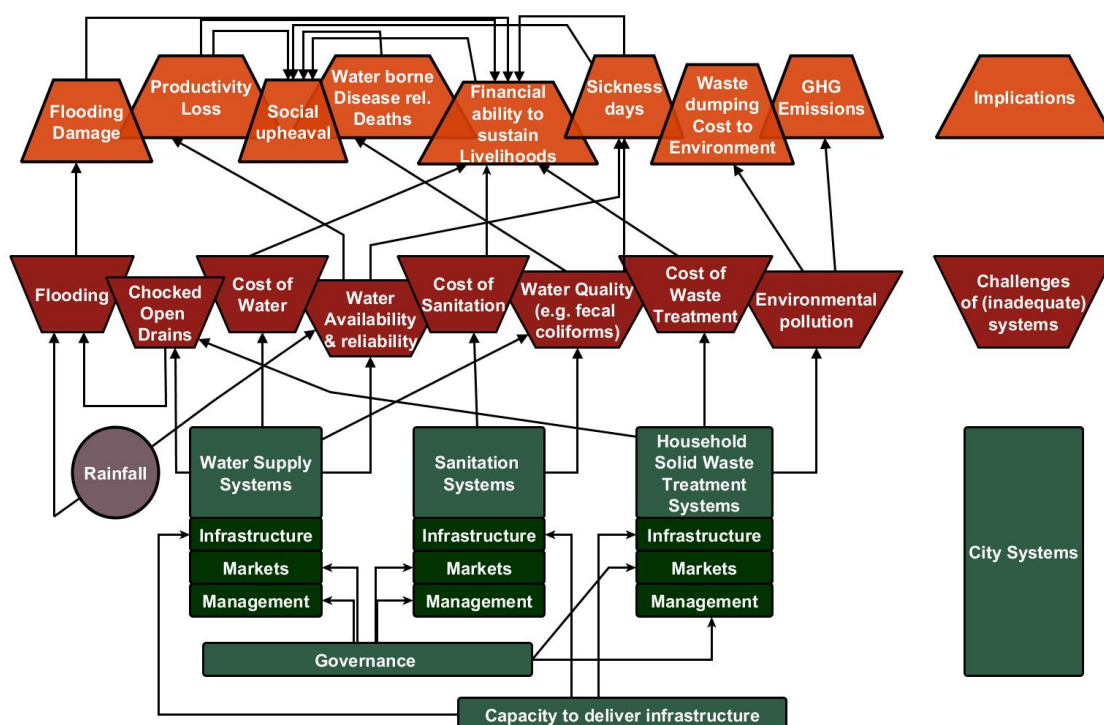


Figure 1 – An overview of challenges due to inadequate WASH systems in GAMA and their implications.

4. GAMA Water and Sanitation Baseline

[TBD – baseline statistics]

5. Sector Application Decision Use Cases

As part of the demonstration of functionality in 1st/2nd quarter 2016 the model prototype will include a number of WASH sector related technology and policy decision interventions. The exact set of interventions will need to be determined progressively during the project, based on existing plans in the GAMA city-region and with local stakeholders, and the examination of specific technology options.

A first listing of interventions, based on the 24th of March sector selection workshop and the 26th of March workshop with the WASH technical experts group, both held in the GAMA, Ghana, includes:

- **Decentralized sanitation treatment**, the direct communal scale treatment of human sanitation wastes such as through biogas and slurry recovery of wastes in a bio-digester.
- **Governance**, the implications of the inability to operate, maintain existing infrastructure due to a lack of available capacities, as expressed by key performance indicators simulated in the model.
- **Waste water treatment infrastructure**, the construction and operation of treatment plants to deal with end of operation waste water flows based on physical, chemical and/or biological means, for disinfected and clean return into the environment and for human use.
- **Surface water treatment infrastructure**, the construction and operation of treatment plants to upgrade the quality of available surface water, such as slow sand filtration systems.

6. WASH Sector data sources

To define the WASH sector baseline in the GAMA city-region and to understand the impacts of proposed solutions, four groups of data requirements are needed, **Geospatial, Population and household, WASH sector flows and WASH sector infrastructure**. A first list of institutions with appropriate data sources has been developed based on input from the 26th March WASH technical experts group.

No.	Institution	Primary data group
1	CERGIS – Centre for remote sensing and geographic information services	Geospatial
2	LUPMP – Land Use Planning and Management Project - Town and Country Planning dept.	Geospatial
3	ILGS – Institute of Local Government Studies	Geospatial
4	Land Commission	Geospatial
5	Ghana statistics office	Population & Household
6	National Population Council	Population & Household
7	District Citizen services MMDs	Population & Household
8	Ghana water network partnership	WASH sector flow
9	Water research institute	WASH sector flow
10	Water resources commission	WASH sector flow
11	Environmental Protection Agency	WASH sector flow
12	Ghana standards office	WASH sector flow
13	Water Aid	WASH sector flow
14	African institute of water and waste management	WASH sector infrastructure
15	Ghana water company	WASH sector infrastructure
16	Coalition of water NGOs	WASH sector infrastructure
17	WB – World Bank Ghana sanitation project	WASH sector infrastructure
18	Ghana statistical service	WASH sector infrastructure

Table 6.1 - List of institutional data sources for the WASH sector in GAMA.

Appendix A – Attendees of technical experts group meetings 26th March 2015

Organisation	Name
Global Water Partnership	Maxwell Boateng-Gyimah
MLGRD / EHSD	Samuel A Allotey
Ministry of Local Government and Rural Development (MLGRD)	Guideon Lomoki
Environmental Services Providers Association	Fred Omari
Ghana Green Building Council (GGBC)	Sylvia Akotia
University of Kumasi – Institute of Sanitation and Waste Management plus Zoomlion Group	Bob Manteaw
Environmental Protection Agency	William Hayfron-Acquah
Environmental Protection Agency	Joy Hese Ankomah
National Development Planning Commission (NDPC)	Felix Addo-Yobo
University of Ghana, Institute for Environment and Sanitation	Dr Opoku Pabi
Water Resources Commission	Edwin Anim
Institute for Local Government Services (ILGS)	Edward Aboagye
Peoples Dialogue / Slum Dwellers International	Braimah R Farouk
Ministry of Local Government and Rural Development (MLGRD)	Sylvanus Kofi Adzornu
University of Ghana, Centre for remote sensing and geographic information services	Foster Mensah