AHK
Delegation der Deutschen Wirtschaft in Ghana
Delegation of German Industry and Commerce in Ghana

Building Partnerships for a ENVIRONMENTAL PROTECTION made in Germany Sustainable Infrastructure

ACCESS TO CLEAN DRINKING WATER & SUSTAINABLE WATER MANAGEMENT IN GHANA

October 2018

Supported by:

Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

Imprint

Publisher
Delegation of German Industry and Commerce in Ghana
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Print
Ad Ink

Design
Delegation of German Industry and Commerce in Ghana

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iStock photo/wavebreakmedia

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Acronyms and Abbreviations

1D1F	One District One Factory
AFD	Agence Français de Développement
AfDB	African Development Bank
AMCOW	African Ministers' Council on Water
AVRL	Aqua Vitens Rand Ltd
BoG	Bank of Ghana
BTI	Bertelsmann Transformation Index
CAPEX	Capital expenditure
CLTS	Community-Led Total Sanitation
CONIWAS	Coalition of NGOs in Water and Sanitation
CWSA	Community Water and Sanitation Agency
DPs	Development Partners
DA	District Assemblies
DWD	District Works Department
DWSP	District Water and Sanitation Plan
EHSD	Environmental Health and Sanitation Directorate
EU	European Union
EUWI	EU Water Initiative
GAMA	Greater Accra Metropolitan Area
GIIF	Ghana Infrastructure Investment Fund
GDP	Gross domestic product
GNI	Gross national income
GoG	Government of Ghana
GPRS	Ghana Poverty Reduction Strategy
GPRSII	Ghana Growth and Poverty Reduction
GWCL	Ghana Water Company Ltd
HH	Household
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme (UNICEF/WHO)
LIC	Low-income country
m3	cubic meters
M&E	Monitoring and evaluation
MDGs	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MoLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MoE	Ministry of Education
MoFEP	Ministry of Finance and Economic Planning
MoH	Ministry of Health
MoSWR	Ministry of Sanitation & Water Resources
NCWSP	National Community Water and Sanitation Programme
NESSAP	National Environmental Sanitation Action and Investment Plan
NWP	National Water Policy
NGOs	Nongovernmental organizations
NPL	Non-Performing Loans
O&M	Operations and maintenance
OPEX	Operations expenditure
PBGs	Policy Based Guarantees
PPPs	Public Private Partnerships
PURC	Public Utilities Regulatory Commission
PWD	Public Works Department
PIM	Project Implementation Manual
RBB	River Basin Board
RCN	Resource Centre Network
RSH	Rural sanitation and hygiene
RWS	Rural water supply
SEC	State Enterprises Commission
SIP	Sector investment plan
SWA	Sanitation and Water for All
SWAp	Sector-Wide Approach
SWG	Sector Working Group
ToR	Terms of Reference
TPP	Tripartite Partnership Project
UNICEF	United Nations Children's Fund
USH	Urban sanitation and hygiene
UWP	Urban Water Project
UWS	Urban water supply
VBA	Volta Basin Authority
VRA	Volta River Authority
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organization
WRC	Water Resources Commission
WSMP	Water Sector Monitoring Platform
WSP	Water and Sanitation Program
WSS	Water and sanitation sector
WASH	Water, Sanitation and Hygiene
WATSAN	Water and Sanitation
WSMT	Water and Sanitation Management Team
WSSDP	Water Sector Strategic Development Plan
WRI	Water Research Institute
WD	Water Directorate
WRM	Water Resource Management
WGI	World Bank's Worldwide Governance Indicators

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Executive summary

BMU- "Environmental Technologies Export Initiative"

Innovations in environmental protection and climate protection as well as resource efficiency offer considerable potential for environmental relief and opportunities for sustainable economic development. In the future, environmental technologies and environmental innovations will increasingly become drivers of prosperity. Launched in 2016, the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU) "Exportinitiative Umwelttechnologien" aims to disseminate environmental technologies and thereby make a concrete contribution to sustainable development and better living conditions in other countries. The environmental relevance of sustainable technologies should also facilitate the export of German environmental experiences and environmental technologies.

Environmental technologies, climate protection technologies and efficiency technologies open great opportunities for German companies to establish themselves on an international level and open sales markets worldwide.

The "Environmental Technologies Export Initiative" of the BMU focuses on the transfer of knowledge and technology transfer, especially in areas of competence of the BMU. These include, for example:

- Water management and wastewater management
- Circular economy as well as waste management and raw materials management
- Resource efficiency
- Wastewater treatment and soil treatment
- Sustainable or energy-efficient construction and urban development
- Sustainable consumption
- Environmentally friendly mobility
- Air pollution control.

This study aims to create a snapshot of the water sector in Ghana giving an overview of the current situation, the trends and conditions on site, and to inform industry stakeholders of the opportunities available to them in the water and waste water sectors in Ghana. The Delegation of German Industry and Commerce in Ghana (AHK Ghana) prepared this analysis using information obtained on a selective basis from desktop analysis, internet research, interviews with industry contacts and technology providers, questionnaires, emails and telephone calls.

The Delegation of German Industry & Commerce in Ghana engaged water sector stakeholders at the national, regional and district levels, and organized a stakeholder workshop to review interim findings with advisors. The workshop served to facilitate a professional and solution-oriented exchange between relevant actors from Ghana and Germany. In addition to a transfer of knowledge and approaches to financing; technical expertise, and capacity building, the foundation for further practical cooperation between the participants was laid out in a strategy paper. The workshop focused on government officials, NGOs, civil society organizations, the private sector, banks and development organizations involved in this topic.

1. Country Profile

1.2 Ghana in brief

Ghana sits on the Atlantic Ocean and borders Togo, Cote d'Ivoire, and Burkina Faso. It has a population of about 29.6 million, In the past two decades, it has taken major strides toward democracy under a multi-party system, with its independent judiciary winning public trust. Ghana consistently ranks in the top three countries in Africa for freedom of speech and press freedom, with strong broadcast media, and radio the medium with the greatest reach. Factors such as these provide Ghana an enabling environment with a shared sense of identity and cooperation.

1.3 Economic outlook

Ghana's economy recovered in 2017 following sluggish growth in the past five years. Gross domestic product (GDP) recovered with real GDP growth of 8.5% in 2017 and is projected to grow by 7.0% in 2018 following slowdowns for five consecutive years as a result of domestic and external negative shocks. Growth was further constrained by the implementation of tight fiscal and monetary policies under the International Monetary Fund (IMF) Extended Credit Facility (ECF) programme. The rebound of real GDP in 2017 was driven by stepped up oil production from the new Tweneboa Enyenra Ntomme (TEN) oil field that coincided with recovery in international price for crude oil and postponed repair shutdown at the Jubilee FPSO. In the medium term, GDP projections show sustained positive growth prospects. GDP is expected to grow at an average of 6.4% in 2018 and 2019 sup- ported by continued crude oil production, gradual recovery in the non-oil sector, favorable business and consumer sentiments as well as narrowed fiscal and current account deficits accompanied by declined inflation and lowered interest rates.[1]

The Government's programmes seek to revive growth in the non-oil sector, particularly the labor-intensive agriculture sector, and promote private sector-led growth. The 2017 budget eliminated or curtailed over 15 tax measures that the Government described as 'nuisance taxes', responsible for subduing growth in the private sector. After prolonged slow GDP growth and deficits in both the fiscal and current account balance, to sustain Ghana's positive growth prospects it will be essential to restore macroeconomic stability and reduce the twin deficits as well as public debt. Infrastructure development has been identified as critical to achievement of the President's vision to industrialize Ghana under the One District One Factory (1D1F) policy and move Ghana beyond aid. Infrastructure is therefore a Government priority, for which it will be necessary to mobilize public financing, but also private sector financing through the Ghana Infrastructure Investment Fund (GIIF), public-private partnerships (PPPs), co-financing, and policy-based guarantees (PBGs).

Table 1: Macroeconomic indicators

	2016	2017(e)	2018(p)	2019(p)
Real GDP growth	3.7	8.5	7.0	5.9
Real GDP per capita growth	1.4	6.2	4.8	3.7
CPI inflation	17.5	12.4	9.0	7.3
Budget balance (% of GDP)	-8.9	-6.7	-6.8	-7.6
Current account (% of GDP)	-6.7	-4.8	-6.7	-8.0

Source: African Development Bank Group, African Economic Outlook 2018

The structure of the economy remains broadly unchanged with a continued dominance of the services sector, although its contribution to GDP fell slightly from 56.8% to 56.2% between 2016 and 2017 as higher oil production led to an increase in the contribution of the industrial sector to GDP. The industrial sector's contribution to growth increased slightly from 24.3% in 2016 to 25.5% in 2017. The sector grew by 16.7%, which was largely driven by the mining and

[1] Ghana's current population of 29.6M and economic outlook is defined by the World Bank – Country Overview 2018

quarrying sub-sector, on the back of improved performance in the oil and gas subsectors (5.7%). Services grew by 4.7% in 2017 with transport, storage and communication that contributed 17.1% to GDP, followed by the retail sector (12.1%), construction (14.3%) and financial sector (9.1%). The agriculture sector grew by 8.4%, but its contribution to growth remained fairly stable at 19.1% in 2017 from 18.9% in 2016. Sub-sectoral growth included fishing (11.7%), crops 9.4% (the cocoa sub-sector grew by 17.3%), forestry and logging (1.6%), and livestock (1.1%).[2]

Table 2: GDP by sector (Percentage of GDP)

	2011	2017
Agriculture, forestry, fishing and hunting	26.0	19.1
of which fishing	1.7	1.2
Mining and quarrying	8.6	6.1
of which oil	6.9	5.9
Manufacturing	7.1	4.7
Electricity, gas and water	1.4	1.5
Construction	9.2	14.3
Wholesale and retail trade; repair of vehicles; household goods; restaurants and hotels	11.6	12.7
of which restaurants and hotels	5.5	6.1
Transport, storage and communication	12.8	17.1
Finance, real estate and business services	6.6	9.1
Public administration and defence, security	7.2	5.6
Other services	9.5	9.7
Gross domestic product at basic prices / factor cost	100.0	100.0

Source: African Development Bank Group, African Economic Outlook 2018

For the financial sector, it is crucial to address non-performing loans (NPLs) and undercapitalization in the banking sector. As of April 2018, the Bank of Ghana (BoG) announced the creation of the Consolidated Bank Ghana. Ltd to take over five struggling banks in the country. Sovereign Bank, Royal Bank, The Beige Bank, Construction Bank and Unibank are the five financial institutions run into liquidity challenges. Government has made 450m cedis available for the Consolidated Bank as starting capital and appointed an administrator for the bank. These banks suffered from severe capital impairment among other things, including inefficient corporate governance. To restore the stability of the financial sector, the BoG introduced recapitalization plans for banks with inadequate capital, imposed the implementation of collateral requirements, and made provision for emergency liquidity assistance. The BoG also increased the minimum capital requirement of banks from Ghanaian cedi (GHS) 120 m to GHS 400 m, ordered bank recapitalization and established a deposit protection scheme to protect small depositors.

1.4 Political context

Ghana upheld its democratic credentials by holding peaceful elections in December 2016 and organizing a smooth transfer of power in January 2017. Ghana's December elections saw power pass from the former President John Dramani Mahama of the National Democratic Congress (NDC) to President Nana Akuffo-Addo of the New Patriotic Party (NPP). The NPP won 53.85% of the votes and the NPP 44.4%. This was the first time since multiparty democracy was introduced in 1992 that an incumbent President has lost power after a single term of four years in office. President Nana Akuffo-Addo has signaled several changes of policy based on his party's political manifesto. They include a

[2] African Development Bank, African Economic Outlook 2018

stronger focus on economic recovery, broad- based industrialization underpinned by the One District One Factory (1D1F) policy, and the pursuit of economic self-sufficiency under the 'Ghana Beyond Aid' agenda.

A year after being elected President in a peaceful election, President Akufo-Addo has had some challenges. fulfilling his election pledges—including setting up a factory in each of the nation's 216 districts, one dam for every village and providing free high school education. Though the government has started implementing some of its promises, such as planting for food and for jobs, and the free secondary education. The authorities need to pay attention to proper fine tuning and funding in the years ahead.

Ghana has made substantial progress in governance compared with its peers as measured by various good governance indicators. The Freedom House Freedom Index 2018 ranked Ghana the second freest country in Africa with a score of 83 out of 100, after Mauritius (which scored 89). According to the Bertelsmann Transformation Index 2018, Ghana performed better than the West African average in various areas of democratic governance. For instance, it scored 7.9 (out of 10) under 'democracy' compared to the West Africa average of 5.5. The World Bank's Worldwide Governance Indicators (WGI) report for 2016 accorded Ghana 40 on political stability and absence of violence [3]

1.5 Trade & Industry

Trade also showed a positive rebound in the first half of 2017, following deficits of $1.38bn in 2014, $3.93bn in 2015 and $506m in 2016. According to preliminary data from the Bank of Ghana (BoG), a trade surplus of $707.6m was generated in the first three quarters of 2017, equivalent to 1.5% of GDP, marking a significant turnaround from the $1.8bn deficit recorded for the same period in 2016. Boosted by stronger oil, gold and cocoa prices, export revenues shot up 25.1% year on year, while declining non-oil imports lowered total imports by 5.3%. The positive terms of trade had a noticeable impact on shrinking Ghana's current account deficit, which fell to 2.4% of GDP over the first three quarters of 2017, compared to 4.9% in the same period of 2016. Combined with growth in portfolio investment inflows, the overall balance of payments went from a deficit of $1.4bn in the first half of 2016 to a surplus of $379.3m, or 0.8% of GDP. To maintain this momentum, trade licensing is moving towards the one-stop-shop concept, via the wherever this is efficient and effective National Single Window Programme, an all-of-government automation and integration approach to link government agencies and private sector operators involved in international trade, utilizing existing systems and infrastructure.

The government aims to couple the expansion of the resources sector with an aggressive industrial policy, an overhaul of the agricultural sector, and improved access to financial services to ensure greater economic diversification and value addition. Forming the key tenets of the NPP's policy are the One Village, One Dam and One District, One Factory programme, which were announced during the 2016 election campaign. The schemes include large-scale investments to ensure greater access to irrigated land, plans to decentralize industrial growth to each of the country's 216 districts and the production of value-added products, particularly from the agricultural sector. Private investors are expected to provide the bulk of financing, and over 100 projects are currently in the pipeline. The local press reported in March 2017 that the One District, One Factory initiative had already received investment pledges totaling $3bn, with 40 business plans under review, and that GHS94.4m ($22.6m) had been earmarked for the One Village, One Dam project. At the same time, as with most countries developing on an extensive scale, Ghana's push for greater industrial progress has the potential to augment the negative impacts associated with sharp inflows of foreign currency.

[3] Oxford Business Group, The Report 2018

2. Water Resources Potential in Ghana

2.1 Water Resources

Ghana is abundant in water resources with seasonal but plenty rainfall. Two expansive river basins and Lake Volta, one of the world's largest artificial lakes, are available as water reservoirs. In addition, there are large groundwater resources underneath the Volta Basin replenished by seasonal rains. Ghana's estimated renewable water volume is 53 billion cubic meters annually. Ghana's water resources potential is divided into surface and groundwater sources. Surface water resources are mainly from three river systems that drain Ghana, namely: the Volta, South Western and Coastal river systems. The Volta system is made up of the Red, Black and White Volta Rivers as well as the Oti River.

The South-Western river system is made up of the Bia Tano, Ankobra and Pra rivers. The Tordzie/ Aka, Densu, Ayensu, Ochi-Nakwa and Ochi-Amissah comprise the Coastal river systems. These river systems make up 70%, 22% and 8% respectively of Ghana's total land area of about 240,000 km^2. In addition to these, the only significant natural freshwater lake in Ghana is Lake Bosumtwi. This is a meteoritic crater lake located in the forest zone, with a surface area of 50 km^2, and a maximum depth of 78m.

Rainwater harvesting has a great potential to increase water availability Generally, rainfall decreases from the south-west of the country (2,000 mm/year) towards the north (950 mm/year) and the south- east (800 mm/year). With appropriate technology and incentives, rainwater harvesting could provide a reasonable amount of water for household and other institutional water needs thereby reducing demand on the pipe-borne system and therefore the resource.

The Ghanaian government is considering enacting appropriate legislation to be implemented through authorities such as the Metropolitan, Municipal and District Assemblies, and also provide incentives towards making rainwater harvesting a viable option to supplement household and institutional water requirements. [4]

Figure 1: Logistics Cluster Assessment Maps – Ghana/www.logistics.org

[4] National Water Policy 2008

2.2 Water Supply in Ghana [5]

As in many Sub-Saharan African countries, drinking water supply and sanitation are major challenges for the Ghanaian authorities and the entire population. The most pressing issues are irregular supply of drinking water, large water loss on the way to the consumer, low water pressure, and very limited access to sewage systems. Inequity and inequality in distribution and access to water continue to challenge the population. The provision of safe drinking water is a challenge in remote rural areas.

In urban areas, water supply, sanitation and wastewater infrastructure fail to satisfy needs and demands of large shares of the population. Therefore, Ghana's water industry has been the subject of constant reform efforts since the 1990s. The aim was to involve private companies, among others, to decentralize the rural water supply in the 216 districts and to promote municipal participation in water management. However, it was only with the establishment of the so-called National Water Policy 2008 that a stringent, targeted strategy was pursued. Simultaneous to these reforms, the sector agencies put together subsector investment plans aimed at marshalling resources to address corporate targets, although in the 1990s these were not effectively aligned with set national targets.

In recent years both the Community Water & Sanitation Agency (CWSA) and Ghana Water Company Limited (GWCL) have developed Strategic Investment Plans (SIPs) that have considered the country's coverage targets—structured into medium-term and long-term—and there has been a more open discussion of these documents by sector stakeholders. Whilst there is still some disconnect between targets and resource allocation, there is evidence to suggest that these are increasingly being aligned. The reforms have raised the visibility and importance of water and sanitation in the respective ministries (Ministry of Sanitation & Water Resources for water supply; Ministry of Local Government & Rural Development (MoLGRD) for sanitation)

The amount of necessary investments in the supply of drinking water and a simple wastewater disposal is estimated differently. While the 2010 Joint Monitoring Program (JMP) Report of UNICEF / WHO estimated that $ 237 million a year will be spent on water supplies, the Ghanaian government has envisaged a recent Water Sector Strategic Development Plan (WSSDP) Investment of US$ 5,416.48 million. According to WSSDP, the government wants to cover 41.49% of the costs of the state budget and cover 48.98% through loans and grants from developing countries or partners. This market will be of great interest to German water companies if the Ghanaian government seriously pursues its goals and funds from the Compact with Africa - an objective of the German G20 presidency to increase attractiveness of private investment through substantial improvements of the macro, business and financing frameworks.[6]

Ghana halved the proportion of the population without sustainable access to safe drinking water by 2015, in line with targets for water outlined in the Millennium Development Goals (MDGs). Even with these improvements, water access, affordability, and quality continue to be predominant concerns, in both rural and urban areas, including the Greater Accra Metropolitan Area (GAMA). Only about 30% of the population in Accra has access to clean drinking water for at least 12 days a day, and 35% on just two days at least five days a week, while 10% have no access to safe drinking water.[7]

Table 3: Estimates of access to Improved sources of drinking water [8]

	Ghana (Total)	Ghana (Urban)	Ghana (Rural)
1990	56 %	84 %	39 %
2015	89 %	93 %	84 %

Source: UNICEF and World Health Organization (WHO), 2015

[5] National Water Policy 2008

[6] Water Sector Strategic Development Plan (2012 – 2025)

[7] Institutional & Policy Mapping of the Water Sector in Ghana; EDGES Program on Water Governance

[8] "An improved drinking water source is one that, by the nature of its construction, adequately protects the source from outside contamination," the list of improved sources includes: piped household water connection located inside the user's dwelling, plot or yard, public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, rainwater collection (UNICEF & WHO, 2015)

3. Water Sector Situation & Challenges

The government of Ghana's vision, goal and objectives of the water sector have been informed by an analysis of existing and emerging challenges in the water sector. The current situation in the water sector in Ghana has been analyzed along two main lines – service delivery and cross-cutting issues.

3.1 Service Delivery

3.1.2 Water Service Delivery

The national water coverage rate was estimated at 63.15% in 2012 based on provider estimates and 86.00% in 2010 based on user surveys conducted by the Ghana Statistical Services and reported by the Joint Monitoring Platform (JMP). Based on the provider-based estimates for the national water coverage for 2012, about 36.85% of Ghana's population were yet to be served with potable water as at the end of 2012. These were mainly residents of rural areas, low-income urban communities and peri-urban areas. With an anticipated increase in population especially in urban areas, additional investments are expected to be provided to meet future increase in demand for water services.

3.1.3 Urban and Peri-Urban Water Services

In the majority of urban areas, water is rationed due to a combination of high demand and inadequate supply. It is significant to note that there is lack of proper metering of urban water production and consumption by GWCL and therefore data available are largely anecdotal estimates by GWCL. For 2012, the agency estimates that against a daily demand of 1,13Mm^3, it was only able to produce 0.708Mm^3 (62.65%) per day. Ghana Water Company Limited (GWCL) records reveal extremely high losses on account of non-revenue water, reckoned to average around 50%. Its bill collection ratio is also at about 95%. The trends in water production, non-revenue water and bill collection over the period 2008-2012 are presented in Table 4.

Table 4: Trends in Water Production, Sales & Non-Revenue Water

Item	Unit	2008	2009	2010	2011	2012
Unit production cost	usd/m^3	0.812	0.633	0.683	0.760	0.768
Coverage	%	56.5	58.0	59.0	62.2	62.9
Customer strength	Nr	378,267	418,449	438,034	457,842	481,384
Non-revenue water	%	51.5	51.5	49.8	49.1	48.8
Bill collection ratio	%	92.9	96.7	90.9	96.7	98

Source: GWCL Corporate Planning Unit, November 2013

The proportion of non-revenue water i.e. water that is lost before reaching the consumer, is more than twice the international best practice level of 20% and even the benchmark of 33% for the low-income country peer group. [9]The average bill collection ratio for the period is also lower than the benchmark of 96% and 99.2% for low and middle-income country peer groups.[10] There are two explanations for the high level of revenue loss. The first is the ageing and poorly maintained distribution infrastructure which is riddled with leaks. Second is a high level of theft from the distribution network, sometimes for the purposes of secondary retailing to sachet (commercial) water producers. Unstable electricity supply, encroachment, illegal small-scale mining activities ("galamsey"), delays in payment of compensation, rationing and its effects on equipment and mounting customer indebtedness are all factors that affect the efficiency of GCWL's operations, resulting in the suboptimal delivery of urban water services.

[9] World Bank (2010) Ghana Infrastructure. A Continental Perspective. Africa Infrastructure Country Diagnostic. Country Report

[10] ibid

In future, appropriate metering of water production and consumption is expected to be established. In order to improve service delivery, it will also be necessary to create stronger incentives for GWCL to address the issue of non-revenue water and to improve water production levels, the distribution network and bill collection.

3.1.4 Peri-Urban and Low-Income Urban Communities

Although Government of Ghana (GoG) is committed to improving water service delivery in peri-urban areas and low-income communities, a lot of more work needs doing to properly define peri-urban areas, establish current water supply levels and supply options and chart a strategy for providing water services to these areas. A study by the Public Utilities Regulatory Commission (PURC) concluded that the majority of the poor are un-served directly by GWCL except through informal services or secondary and tertiary sources.[11] PURC and GWCL are in the process of developing a strategy for improving water service in these areas. In the interim, proposals have been made in the Water Sector Strategic Development Plan (WSSDP) to improve the supply of water to these areas.

3.1.5 Rural and Small Towns Water Service[12]

About 38% of the population in rural communities and small towns are yet to be served with potable water supplies.[13] Although communities are responsible for the operation and maintenance of water facilities in the rural and small towns water sub-sector, responsibility for water quality monitoring as well as major rehabilitation and replacement of infrastructure remains to be clarified. It is estimated that between 12% and 20% of water facilities in rural communities and small towns are either non-functional or functioning below the expected standards at any given time. CWSA lacks adequate data on the functionality of water systems and when existing water facilities were installed. This affects planning for operation and maintenance (O&M), rehabilitation and replacement of facilities that may have outlived their lifespan. Water supply technology options remain limited to hand dug wells (with or without pumps fitted), boreholes (fitted with any of four approved pumps)[14], spring catchment systems, limited mechanization and piped schemes. Self-supply initiatives and rain water harvesting systems are limited and the needs of persons with disability (PWDs) receive little consideration in the design of water supply systems. Equally disturbing is the fact that the unit cost of delivering water services is higher for Ghana than in other countries in the Sub-Saharan Africa region. More needs to be done towards developing more affordable and disability-friendly technology options designed to reduce the financial and social costs of accessing water in rural areas and small towns.

CWSA has been able to establish a private sector managed distribution system of hand pump spare parts for the four recognized hand pumps in Ghana. Sales outlets have been opened in all of the ten regions and the private operator has completed the repayment of the seed funds provided to kick-start the network. According to CWSA, the privatized network is becoming financially sustainable and will stay operational when subsidies to the private operator end in the near future. The challenge remains with extending the distribution network to the district level. Anecdotal evidence shows that the private sector is not interested in spare parts distribution at the district level, where demand volumes tend to be low.

[11] PURC (2005) Public Utilities Regulatory Commission (2005) Urban Water Tariff Policy.

[12] Water Sector Strategic Development Plan (2012-2025)

[13] Rural and small-town coverage rates from the Community Water and Sanitation Agency (CWSA 2012)

[14] The four standardized pumps are Ghana Modified Indian Mark II, AFRIDEV, Nira AS 45 and Vergnet

3.1.6 Water Quality Monitoring

Varied forms of water quality monitoring are currently being carried out in the rural/ small towns' and urban water sub-sectors. While PURC is responsible for monitoring urban water quality, it lacks the required equipment and logistics for doing so effectively and, thus, relies on GWCL facilities for water quality testing. In the rural water sub-sector, there is currently no system in place for monitoring water quality at point sources, beyond the initial water quality tests that are conducted prior to handing over these facilities to communities. The operational guidelines developed by CWSA for the Water and Sanitation Management Teams (WSMTs) require WSMTs to carry out water quality monitoring of piped schemes twice a year. The degree of compliance with this requirement has not been established. However, CWSA has developed a framework for water quality monitoring in the rural and small towns' sub-sector which is expected to address the lapses in the current system for water quality monitoring.

The Water Resources Commission (WRC) is yet to develop a framework for monitoring water quality in river basins. It is expected that a comprehensive national water quality monitoring framework will be developed to address relevant issues across all the three main sub-sectors i.e. rural and small towns, urban, and water resource management.

3.1.7 Basic Sanitation and Hygiene

About 20% of the entire country's population practice open defecation. The practice is much more widespread in the three regions of Northern Ghana (Northern, Upper East & Upper West Regions) where more than 70% of the population practice open defecation. There is also a weak culture (especially in the rural areas) of individual household latrine ownership in Ghana. A high proportion (almost 51%) of Ghanaians uses communal latrines which, according to the Joint Monitoring Programme of WHO/UNICEF, are classified as unimproved. Ghana intends conducting research into the shared latrine phenomenon with a view to developing an agreed national definition for sanitation coverage. The national sanitation coverage rate was estimated at about 14% in 2010. Quite clearly, it will require enormous effort to achieve the MDG target of 53% sanitation coverage by 2015.

The Ministry of Local Government and Rural Development (MLGRD) has prepared a National Environmental Sanitation Strategy and Action Plan (NESSAP) and accompanying Strategic Environmental Sanitation Investment Plan (SESIP) to guide investments in the sector towards implementing the NESSAP. NESSAP seeks to adopt Community Led Total Sanitation – an innovative methodology for mobilizing communities to completely eliminate open defecation. Communities are facilitated to conduct their own appraisal and analysis of open defecation and take their own action to become open defecation free. This serves as a means of accelerating the population's access and use of basic sanitation. In line with that agenda, a national rural sanitation model and costed scaling-up strategy have been developed for implementation. A national strategy to promote hand-washing with soap has also been developed by CWSA and, effective 2005, is being implemented in collaboration with allied agencies and the private sector.

3.2 Cross-Cutting Issues

3.2.1 Institutional Capacity Development and Governance

Considerable progress has been made in the area of institutional reform and alignment in the water sector. The transformation of the erstwhile Ghana Water and Sewerage Corporation (GWSC) into the Ghana Water Company Limited, the establishment of the Community Water and Sanitation Agency, the involvement of MMDAs and communities in the management of rural and small towns water and sanitation facilities within the framework of the National Community Water and Sanitation Programme (NCWSP) and the establishment of the Water Directorate and the Environmental Health and Sanitation Directorate at MoSWR and MLGRD respectively are key milestones that have improved governance in the water sector.

Reporting on sector progress and tracking of investments by stakeholders – GoG's diverse MDAs, sector Development Partners (DPs) and Non-Governmental Organizations (NGOs), and the private sector – has been weak. It has been difficult tracking allocations and expenditures by GoG and DPs in the water sector owing to the lack of a harmonized system for disbursing funds. In particular, there is very little information on the contribution of NGOs to the sector due to the weak regulatory and reporting framework. Civil society and MMDA engagement with sub-sector institutions especially with GWCL is weak. There is much room for improving collaboration between MMDAs and sub-sector institutions, especially between MMDAs and GWCL in urban water delivery.

In the absence of a strong decentralized department to support water service delivery at the district level, CWSA has assisted Municipal and District Assemblies to set up temporary District Water and Sanitation Teams (DWSTs) to take charge of the implementation of WASH services/ activities. With the passage of LI 1961 to establish District Works Departments (DWDs), it is anticipated that MMDAs will move quickly to set up these departments and equip them with the required logistics so they could be more effective in the delivery of WASH services at the local level. With support from CWSA, MMDAs and communities have established sub-district structures to manage existing water and sanitation facilities. These structures include Water and Sanitation (WATSAN) Committees and Water and Sanitation Management Teams (WSMTs). There are also Area Mechanics and Latrine Artisans who provide services on demand at the community level.

Anecdotal evidence suggests that these structures and systems tend to lose their effectiveness once CWSA withdraws support when associated projects wind up. By contrast, WATSAN Committees and WSMTs tend to be sustainable where they continue to receive adequate post- project technical support. However, post-project support has been the exception rather than the norm thus far. Within the framework of adopting integrated water resource management as the approach to managing the country's water resources, WRC has, in collaboration with MMDAs, facilitated the establishment of two River Basin Boards (RBBs) and offices as the decentralized management structure to oversee the regulation and management of water resources at the basin level. The WRC has been unable to establish other RBBs due to limited funding. Ultimately, it is expected that RBBs will be established for all river basins in Ghana with the active involvement and leadership by MMDAs.

3.2.2 Capacity

The Water Directorate lacks the formal mandate, required staffing and budgetary allocation from GoG to function effectively. This affects its capacity to support (MoSWR) provide quality leadership on sector issues. The Directorate has operated with very limited staffing, which includes four team members seconded from GWCL. Funds for the Directorate's operations come mainly from DP largesse, influencing perceptions of its neutrality.

There are significant overlaps in the functions of the sector's three main sub-sector institutions – i.e. CWSA, GWCL and WRC. For instance, it is unclear which institution(s) is/are responsible for peri-urban water service delivery. A clarification of roles is required to ensure a more effective harmonization of the agencies' activities. Beyond this, there is also the need to appraise and develop capacities of these agencies to enable them perform their functions more effectively and efficiently. GWCL will require capacity building support to improve urban water service delivery i.e. production, distribution, revenue collection and customer care. CWSA will, likewise, require equivalent support in the areas of human, financial and logistical resources at the national and regional level to enable it fulfil its facilitator and regulatory roles in the rural and small towns sub- sector. This is in recognition of the increasing number of districts CWSA has had to deal with and emerging challenges with rural and small towns' water service delivery.

3.2.3 Regulation

The State Enterprises Commission (SEC) sets performance standards for all the three main agencies in the water sector i.e. CWSA, GWCL and WRC while PURC monitors urban water service standards and approves tariffs. This situation creates potentials for conflicting guidance to the sector agencies. There is, thus, the need to harmonize performance standards between PURC and SEC as well as to clarify mandates and roles regarding regulation in the water sector. The Ghana Standards Authority (GSA) has developed drinking water quality standards and sampling procedures covering the quality of water supplied by public water utilities in Ghana. In the performance of its regulatory function, PURC relies on data and facilities from GWCL which could affect its outcomes and conclusions. The bulk of the water quality testing is currently done at the treatment and distribution points by GWCL itself. There is an urgent need for PURC to monitor water quality further downstream, particularly at the user end of the delivery chain. The regulatory system for rural and small towns is very weak due to lack of an institutional and regulatory framework. A Legislative Instrument - Community Water & Sanitation Agency Regulations, 2011 (LI 2007) has recently been developed to regulate the rural and small towns' water sub-sector.

3.2.4 Coordination

There are significant overlaps in service delivery owing to the blurred boundaries in the mandates of CWSA and GWCL especially regarding peri-urban areas and small towns. Within the peri-urban and small-towns arena, there are currently no guidelines for communities who may wish to exit from GWCL management and enter into community management arrangements or vice versa. It will be advantageous to institute a mechanism for CWSA/GWCL and MMDAs to discuss such situations, clarify relevant procedures and foster consensus with other sector stakeholders.

There is broad consensus for a collective impact approach among key sector stakeholders. Indeed, the most influential stakeholders are willing to rally behind a SWAp on condition that GoG demonstrates strong and capable leadership capacity in the areas of strategic direction, financing and coordination. A code of conduct was signed by key stakeholders but has since lapsed and will need renewing. A country assessment study is expected to establish the financing mechanism and arrangements under the SWAp. Coordination among MoSWR, MoF, MLGRD and DPs needs to be strengthened especially through sharing of information, participation in Sector Working Group (SWG) meetings and ensuring that the water sector is given more priority in GoG's budgetary allocations. There is also the need to reach out to other DPs including the Japanese International Cooperation Agency (JICA), Millennium Challenge Authority (MCA), the Chinese government, etc. in order to encourage them to share information and participate in the SWG meetings.

3.2.5 Finance[15]

Ghana has over the past decade made significant progress in economic growth and development. The shift to lower-middle income status in 2010 presents new challenges to institutional responsibilities, system changes, aid flows and development partnerships. There is a significant shortfall in WASH sector investment to meet national and international commitments which hitherto had been funded with grants and concessional loans. Budgets and resources are insufficient to show tangible impacts on the ground. Over the last eight years, less than 50% of allocated sector funds have been disbursed. Sustainability is also threatened by unrealistic tariffs, negative attitudes towards payment, inadequate post-construction finance, and lack of focus on demand and pro-poor issues.

GoG currently pays the cost of personnel emoluments and administrative expenses of all public institutions in the sector i.e. WD-MWRWH, CWSA, GWCL, EHSD-MLGRD, PURC and MMDAs. These expenses are borne by GoG either through budgetary allocations or through internally generated revenue. GWCL, for example, pays personnel emoluments from its internally generated funds. GoG also makes contributions towards services and investment costs in all these agencies. The commitment made by GoG (under the SWA Compact of April 2010) to invest $350 million annually to accelerate progress towards achievement of the MDG targets has not been fulfilled. However, this commitment is yet to materialize. GoG contributions to water resource management and to the rural and small towns sub-sector have been low, with variations between budgeted and actual allocations reaching as high as 95% in some instances.

The financing deficit impacts the performance of sector institutions adversely, creating delays in implementing planned interventions, undermining maintenance and fueling non-functionality. GWCL operations are, likewise, hampered by limited financing for investments and renewal of assets. As a result, GWCL has been unable to provide satisfactory service to its customers. With GoG lacking the political will to pass on the full production costs of urban water to consumers, water tariffs have been kept artificially low, starving GWCL of the financial resources required to operate and maintain existing facilities effectively and to expand the network. Meanwhile, urban water consumers who are not directly served by GWCL pay considerably higher tariffs for water services.

GoG has instituted lifeline tariffs and subsidies as a means of improving access to water services by the poor. These measures have been poorly targeted and as a result, the subsidies benefit the rich rather than the poor, who tend to use relatively little water. Sector financing is still skewed towards "new infrastructure" with little attention to post-construction and incremental costs by implementing agencies. In a study of investments in the rural and small towns' water sector since the inception of NCWSP, it was established that investments in new facilities accounted for 58% of investments in the rural and small towns sub- sector as compared to 48% for rehabilitation works. The absorptive capacity of some sector agencies and the private sector in utilizing investments in the sector is weak owing to human, procurement and other logistical constraints. Financial resource allocations for water and sanitation activities also tend to be low at the district level.

[15] Water Sector Strategic Development Plan (2012-2025)

Within the framework of the National Community Water and Sanitation Programme (NCWSP), rural communities and small towns continue to bear the full cost of operation and maintenance of water facilities, in sharp contrast with urban consumers served by GWCL. CWSA had until 2006, carried out major rehabilitation and replacement of some existing water facilities. No provision has been made in the CWSA SIP (2008-2015) for rehabilitation and replacement of existing facilities. This situation is a challenge for sustainable water service delivery. Government has abolished the payment of community contribution to capital cost although this decision is yet to be officially documented.

In future, the water sector will require increased financial investment from GoG and other non- traditional sources of financing including private sector sources to ensure sustainable financing of the sector as traditional aid from Development Partners (DPs) begins to decline with Ghana's attainment of lower middle- income status. GWCL, the sole urban water service provider, will be expected to operate as a viable financial entity by significantly reducing its losses from non-revenue water and increasing internally generated revenues. GoG is also expected to increase the required financing for planned investments in the urban water sub-sector.

3.2.6 Knowledge Management, Gender and Monitoring & Evaluation

Research, gender, monitoring and evaluation constitute cross-cutting issues in the water and sanitation sector. The emerging issues around these thematic areas are as follows:

- **Knowledge Management**

Research has been carried out on several sector issues over the years. These conclusions have sought to address sector issues on institutional development, policy and strategy development, financing and science and technology for the sector. Financial support will be required to support further research on other emerging issues in the sector. A considerable number of sectors learning and sharing platforms – such as the National Learning Alliance Platform (NLLAP) – have been established in the sector, especially at the national level. There are currently attempts at replicating the learning platforms at the regional and district levels. There is the need to strengthen and coordinate sector documentation and sharing/ reporting. These initiatives will be supported by the WSSDP in order to improve knowledge generation and sharing on sector issues.

- **Gender**

The complementary roles of both sexes (males and females) have been captured within the framework of the NCWSP. As a result, women have representation on all WATSAN Committees/ WSMTs. Males and females have complementary roles in integrated water resource management as well as in the delivery and management of water and sanitation services at the household level. There is the need to intensify efforts at mainstreaming gender in WASH services delivery.

- **Monitoring and Evaluation**

The Ghana Statistical Service provides user-based data on water and sanitation while sector institutions (particularly GWCL and CWSA) generate provider-based data. As a result, there are substantial variations in data and in the sector. Beyond this, there is also the need to harmonize data on coverage rates between CWSA and GWCL. The population of people served by the two agencies when combined is more than the total national population figure. While CWSA and GWCL claimed to be serving 27.2 million in 2009, the census recorded a significantly lower population of 24.3 million (11% fewer residents) for 2010, even with population growing at over 2%. These variations will have to be harmonized in order to generate data that will be acceptable and applicable to all sector stakeholders.

4. WASH Projects in Ghana

4.1 GAMA Sanitation & WASH Project by the World Bank (2013 – 2020)[16]

The development objective of the Greater Accra Metropolitan Area (GAMA) Sanitation and Water Project for Ghana is to increase access to improved sanitation and improved water supply in the GAMA, with emphasis on low income communities and to strengthen management of environmental sanitation in the GAMA. The project has four components. The first component is provision of environmental sanitation and water supply services to priority low income areas of the GAMA. The objective of this component is to increase the access to environmental sanitation and water supply services in low income areas of the GAMA with a strong focus on liquid sanitation. This component also includes the development and implementation of a hygiene and sanitation behavior change campaign targeted at low-income households, and a major learning and dissemination effort aimed at informing a large-scale institutionalized approach to upgrading sanitation in low-income communities.

The second component is improvement and expansion of the water distribution network in the GAMA. This component will also support the acquisition and installation of water meters and other equipment, as well as the provision of services, aimed at improving water demand management and reducing nonrevenue water. The project which is implemented by Ghana Water Company Limited (GWCL), is to improve and expand the water distribution network in GAMA to provide piped water to an estimated 250,000 people living in low income communities. The end target was to provide 3500 new connections through construction of about 150 km of distribution network. GWCL is on track with implementation of its Annual Workplan, and has made substantial progress towards and is likely to exceed its targeted objectives. To date a total of 130 km of distribution pipelines have been laid, and 2012 new service connections effected, improving water supply to 142,860 people (about 29,00 households). In addition, 60 community standpipes have been constructed in low income communities. About 138 km of additional pipelines are expected to be completed by September 2018, culminating in over 268 km against an initial target of 150 km. With the additional extensions, an additional 3028 new connections are envisaged to be made by September 2018, bringing the total to 5040 and significantly exceeding the targeted 3500 connections. The third component is planning, improvement and expansion of GAMA-wide environmental sanitation services. The objective of this component is to develop integrated GAMA-wide plans for liquid and solid waste management and drainage, and to finance critical elements to improve collection, treatment and disposal of wastewater and septic sludge. Under this component the project will work closely with the International Finance Corporation

The project is also supporting capacity building towards management of water and sanitation service delivery, Technical Assistance to MMAs and national level institutions, support for development of social accountability mechanisms, and support to the Ministry for Sanitation and Water with ongoing sector initiatives, including technical assistance to support dialogue on institutional reforms and broader nation-wide sanitation promotion activities, as well as Behavior Change initiatives. Some key achievements were noted under the Behavior Change Communication (BCC) sub-component, including the communication strategies and engagement with communities and households to facilitate the delivery of the household toilets. The ESICApps, which is an App developed by the project for monitoring environmental sanitation services, is also commendable.

4.2 Smarter WASH project by IRC & Community Water & Sanitation Agency (CWSA)[17]

The SMARTerWASH project (2014-2016) is closed. This project was a huge joint effort of IRC, Community Water and Sanitation Agency (CWSA), Akvo, and SkyFox Limited to improve the rural water sector's monitoring system in Ghana. SMARTerWASH – Mobile monitoring of rural water and sanitation services that last, was a Public Private Partnership (PPP) involving Community Water and Sanitation Agency (CWSA), IRC, Akvo, Water for People, Rabo Bank of Netherlands and SkyFox. This partnership was valid from April 1st 2013 until December 31st 2016. The project. SMARTerWASH sought to ensure that monitoring information is effectively used to sustain water and sanitation services.

[16] The World Bank, GH-GAMA Sanitation and Water Project, Implementation Status and Results Report 2018

[17] IRC Wash/Ghana Strategy 2017-2021

The SMARTerWASH project provided the opportunity to strengthen the ICT infrastructure, by further developing ICT systems by linking them and ensuring interoperability. Furthermore, the project provided an opportunity to test (baseline) data collection at scale**.** By leveraging funding from other initiatives (notably World Bank's Sustainability Rural Water Services Project, Hilton's Strengthening Local Government Capacity Project and UNICEF's Sanitation Knowledge Management Initiative) data collection could be applied at a larger scale than initially foreseen within the SMARTerWASH Project: in 131 (of a national total of 216) districts in 8 regions, instead of only 3 regions, as originally intended. This involved the training of national, regional and district staff, who were involved in collecting data from 23,001 handpumps, 938 piped schemes, almost 15,000 Water and Sanitation Management teams (WSMTs) and 131 service authorities in these districts. This data was processed and made available in the form of regional district level fact sheets and an online atlas.

4.2 United States Agency for International Development West Africa Water Supply, Sanitation and Hygiene Programme (USAID-WA-WASH) 2012 - 2017[18]

The USAID West Africa Water Supply, Sanitation and Hygiene program (USAID-WA-WASH) was carried out between 2011 and 2015 with the overall goal of increasing sustainable access to safe drinking water, sanitation and hygiene in Burkina Faso, Niger and Ghana. The objective of the initiative was to enable:

- the introduction of low-cost WASH technologies
- the promotion of appropriate hygiene practices at the community level
- the implementation of sustainable services delivery models
- support cooperation between national and regional actors
- knowledge sharing across the sub-region

The initiative was funded by USAID and coordinated by Florida International University (FIU) - leader of the Global Water for Sustainability (GLOWS) consortium. Partners included: Winrock International, WaterAid, CARE, the International Water Association (IWA), RAIN, the UNESCO-IHE, IRC, RWSN/SKAT, and Building Partnerships for Development (BPD).

WA-WASH had four areas of intervention: Water, Sanitation and Hygiene (WASH), Food Security, Climate Change, and the cross-cutting activities of gender and capacity building. With this integrated approach, WA-WASH not only responded directly to the assistance objectives of USAID/West Africa's regional priorities, but also created synergies between WA-WASH activities and those of other USAID projects in the region. WA-WASH supported cooperation between national and regional organizations, and a consortium of partners enabled an extensive, on-the-ground network of experienced local development professionals, with expertise ranging from behavior change communications and community-led total sanitation (CLTS) to infrastructure modernization, climate- resilient agriculture, and institutional capacity building.

WA-WASH interventions resulted in access to improved drinking water sources for 65,690 people across Burkina Faso, Ghana, and Niger. More than 62,000 people gained access to improved sanitation facilities. Additionally, more than 21,300 stakeholders, including masons, hygienists, drillers, pump manufacturers, local NGOs, local authorities, decision-makers, farmers, women's groups, students, and faculty members benefited from capacity building interventions provided by WA-WASH within the three target countries since 2012.

[18] USAID West Africa Fact Sheet, USAID-WA-WASH 2012-2017

4.3 UN-Habitat WASH Project in Disaster-Prone Communities[19]

In the context of the national policy and strategy environment, and pursuant to the need to include water, sanitation and hygiene (WASH) as an urgent and complementary need in UN's overall support to disaster prone communities, a Joint UN Programme on Water, Sanitation and Hygiene in Disaster Prone Communities in the Northern Regions of Ghana has been conceived. This joint programming approach is the collective effort through which UN Organizations in Ghana work together to prepare, implement, monitor and evaluate activities aimed at achieving the Millennium Development Goals (MDGs) and other international commitments in close collaboration with national institutional Partners. The project was developed jointly by UN-Habitat, UNICEF, UNDP and WHO in close collaboration with the national institutional partners involved in the WASH and Disaster Management sectors.

The overall objective of the Water, Sanitation and Hygiene in Disaster-prone communities in Northern Ghana Programme ("WASH in Disaster-prone Communities" – WASH in DPC) is to improve health and livelihoods in selected disaster-prone communities and schools by increasing access to good drinking water and proper sanitation facilities on a sustainable basis. Specifically, the project assesses, identifies and implements resilient WASH facilities and services for communities within the geographic scope of the project in the three Northern Regions (Northern, Upper East and Upper West).

Achievements as at 2016:

- In the Upper East Region, construction of Resilient Platform and the installation of Seven (7) Afridev handpumps is complete. Reconnaissance survey in eighteen (18) communities had been completed and recommendations made for resilient water supply structures. UN-Habitat has given the go ahead for the Region to commence the implementation of the recommendations through the procurement of Goods and Works providers.

- Drilling of twelve (12) boreholes out of the fourteen (14) for the Upper West Region had been completed with the construction of Resilient Platforms and the installation of twelve (12) Afridev handpumps. The second batch of communities have been allocated to another organization to deliver because of delays in completing the works in the Region. The Region is however to complete the two (2) water points that are outstanding.

- Drilling of eight (8) boreholes for the Northern region had been completed however the accompanying works could not be done for lack of adequate funds. The UN-Habitat has allocated the second batch of twenty-one (21) communities to another organization and has asked the Region to complete the works on the eight (8) boreholes already drilled.

- Community mobilization activities have been completed in Upper East and Upper West Regions of Ghana

4.3 Ghana beyond the pipe forum by Safe Water Network[20]

Safe Water Network convened its fifth Ghana "Beyond the Pipe" Forum in Accra on March 15, 2017. The objective of this "Beyond the Pipe" was to make the financial case for the scaling up of small water enterprises as a vital component in addressing the 8.2 million Ghanaians (or 30 percent of the country's population) who lack access to safe, affordable, reliable water. The participants included thought leaders from the water sector including government, regulators, development partners, foundations, NGOs and the private sector. Recommendations provided during the event build on more than seven years of experience working in cooperation with communities and sector leaders in Ghana.

The event featured an update on two financing solutions introduced at the 2016 "Beyond the Pipe" Forum: the Ghana Water Enterprise Trust and the Public-Private Partnership (PPP) Pilot Project. The Ghana Water Enterprise Trust update was given by the Safe Water Network-coordinated Finance Group, and was accompanied by a document that

[19] Community Water & Sanitation Agency Annual Report 2016

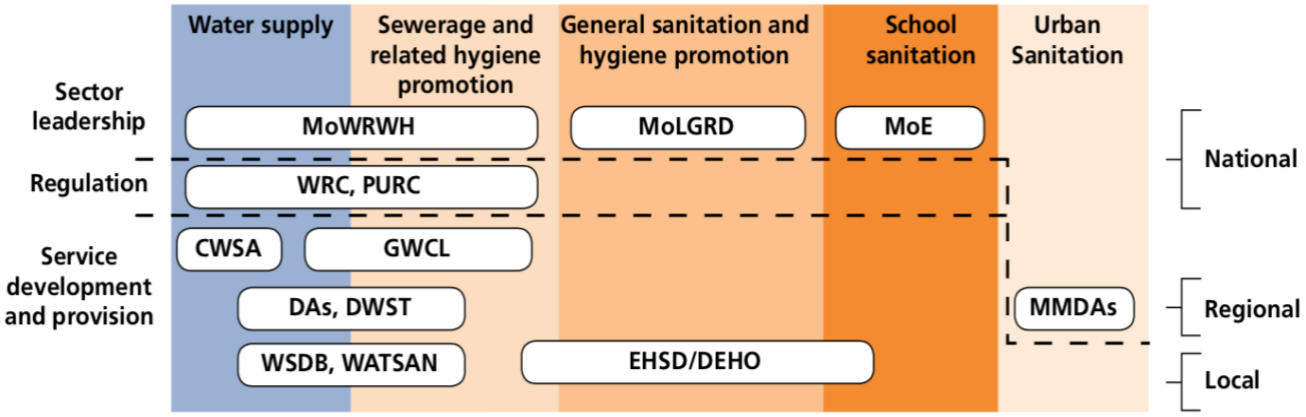
[20] Safe Water Network, Beyond the Pipe Forum Press Release March 2018

captures current thinking on the structure of the Trust. Similarly, the PPP Pilot Project update was delivered by the PPP Working Group, who distributed a corresponding document.

The event's keynote speaker was the Honorable Joseph Kofi Adda, Ghana's former Minister for Sanitation and Water Resources. In his address, Adda emphasized that collaboration is essential to meeting significant challenges and serving those in need, and acknowledged the role for small water enterprises. He also spoke of making the United Nation's Sustainable Development Goal 6.1 (achieving universal and equitable access to safe and affordable drinking water for all) one of the goals of his Ministry.

5. Institutional Framework for Water in Ghana

Figure 2: Institutional Roles and Relationships in the Water Supply and Sanitation Sector



Source: AMCOW Country Status Overview 2015

Ongoing changes in policy and strategic realignment in the WASH sector include reassignment of Mrs. Cecilia Dapaah as the new Minister for Sanitation & Water Resources; departments and agencies from other ministries to the new Ministry of Sanitation and Water Resources, namely the Ghana Water Company limited (GWCL), the Community Water and Sanitation Agency (CWSA), the Water Resources Commission (WRC), the Water Directorate, the Environmental Health and Sanitation Directorate (EHSD) and the schools of hygiene. Scenarios for the future role and functions of the CWSA in the rural water subsector level were outlined following the organizational of water supply schemes especially for small towns and larger piped networks, reconsider roles in the rural water delivery chain, and extend regulations to rural areas, especially for water quality. For sanitation, the Government is working to create a National Sanitation Authority

Economic regulation of the urban water supply subsector has been reasonably well regarded, with the GWCL's tariff decisions subjected to public consultation before approval. This notwithstanding, the Public Utilities Regulatory Commission (PURC) has been unable to penalize the utility when efficiency targets are missed, which has often been the case. The PURC has developed guidelines for tanker service, and is working with various parties to regulate the quality of service of secondary and tertiary providers in urban water supply. PURC responsibilities do not extend to community managed water systems, giving rise to a vacuum since District Assemblies (DAs) do not have the capacity to play this role effectively. Currently, there is no well-defined institutional responsibility for: (a) monitoring and enforcement of drinking water quality for community water supply, and (b) the registration, licensing, certification, and monitoring of the operations of private sector firms in the water business. A positive development during 2010 was the approval by Parliament of regulatory charges to be built into tariffs, to fund the PURC's activities and make it truly independent.

5.1 Decentralizing the effective delivery of water and sanitation services

Decentralization has been ongoing since the 1990s, without resolving conflicts between centralized agencies and the Metropolitan, Municipal and District Assemblies (MMDAs). In 2016, the Local Government Act 2016, Act 936, was passed to accelerate the process, by decentralizing and devolving powers to MMDAs.

Institutional and financial capacities at the local level are improving but require further development. Capacity improvement—training, logistical support, and financial empowerment—is a prime focus many donor projects as DAs are now in the driving seat for their implementation. Many DAs now have District Water and Sanitation Plans (DWSPs) in place and these serve as a basis to seek implementation support. However, allocation of funds dedicated to water and sanitation at the local level is still centrally driven and many DAs do not have the means to steer their own water and sanitation agenda.

5.2 Specific pro-poor units/initiatives

In the rural and small-town water subsector, the dual concepts of demand-driven approaches and community ownership and management - where provision of water facilities are driven by demand and managed by the communities, have improved coverage. However, service improvements necessary to support the poor and unserved fall short in the urban water supply subsector. In major cities such as Accra, pilot projects to serve the urban poor have been undertaken through collaboration between the PURC, GWCL/operator and communities. These projects have remained as pilots and their full impacts and lessons are yet to be developed into knowledge products or replicated in other communities.

5.3 Private sector participation (PSP)

PSP in urban water supply still struggles to make the expected impact, despite considerable financing that has gone into the subsector. The absence of specific performance indicators at the initiation of the management contract constrained monitoring of the operator's performance. In community water supply the participation of local private operators through management contracts has been slow even though a promising start was made some eight years ago.

Table 5: List of stakeholders in the Water Sector in Ghana

Government:

Ministry of Sanitation & Water Resources (MoSWR)	The Ministry of Water Resources, Works & Housing (MoWRWH) is now the Ministry for Sanitation & Water Resources (MoSWR), through its Water Directorate (WD), is responsible for providing leadership for sector activities in policy development, implementation, coordination, monitoring and evaluation. The key agencies of the (MoSWR) related to water are the Water Resources Commission (WRC), Ghana Water Company Limited (GWCL) and Community Water and Sanitation Agency (CWSA) (MWRWH 2014). In addition, the Ministry of Local Government and Rural Development (MLGRD), the Ministry of Finance and Economic Planning (MoF), the Ministry of Education (MoE), the Ministry of Energy, the Ministry of Health/ Ghana Health Service, the Ministry of Food and Agriculture and the National Development Planning Commission (NDPC) all have important functions relevant for the water sector (MWRWH 2014). **Address:** P. O. BOX M.43 Ministries Accra, Ghana **Telephone**: + 233-302-685522 / 685519 **Fax**: + 233302-667689
Ministry for Local Government & Rural Development (MoLGRD)	The Ministry of Local Government and Rural Development, through its Environmental Health and Sanitation Directorate (EHSD), has oversight responsibility for sanitation. MoLGRD has developed and is currently implementing a National Environmental Sanitation Policy and an accompanying plan, the National Environmental Sanitation Strategy and Action Plan (NESSAP) and Strategic Environmental Sanitation Investment Plan (SESIP). Within the framework of implementing this WSSDP, CWSA will collaborate with EHSD to facilitate the implementation of the rural water-related sanitation component of the WSSDP. Specifically, CWSA will, in collaboration with EHSD, support the implementation of the following strategy documents: ▪ rural sanitation model and scaling up strategy; ▪ national hand-washing with soap strategy; and

- national household water treatment and safe storage strategy.

Address: P.O. Box M50 Accra Ghana, West Africa
Telephone: +233 302 908 224/+233 302 906 828
E-mail: client.service@mlgrd.gov.gh
Website: www.mlgrd.gov.gh

Public Utilities Regulatory Commission

The Public Utility Regulatory Commission (PURC) regulates the urban water sector. Its responsibilities include reviewing and approving tariffs as well as monitoring the GWCL and other secondary and tertiary water suppliers (in addition to other functions for electricity and other sectors). In addition to working to ensure that tariffs and rate hikes are reasonable, PURC also works to ensure financial sustainability of the urban water system. To this end, PURC has worked since 2013 to set tariffs for full cost recovery (MWRWH 2014).

Address: No. 51 Liberation Road, Ridge Accra
Postal Address: Box CT 3095, Cantonments – Accra
Telephone: +233-302 240046 +233(0)558082547
E-mail: info@purcghana.com
Website: www.purc.com.gh

Ghana Water Company Limited

Ghana Water Company Limited (GWCL) is a utility company, fully owned by the state. The company is responsible for potable water supply to all urban communities in Ghana. GWCL currently operates eighty-eight (88) urban water supply systems throughout the country. Average production is about eight hundred and seventy-one thousand, four hundred and ninety-six cubic meters (871,496m3) per day (192 million gallons per day). Present potable water demand is estimated at one million, one hundred and thirty-one thousand, eight hundred and eighteen point eighteen cubic meters (1,131,818.18m3) per day (249 million per day).

Urban water supply coverage is therefore about seventy-seven percent (77%). With a staff strength of three thousand, four hundred and seventy-six (3,476), GWCL serves five hundred and fifty thousand, six hundred and fifty-four (550,654) customers, seventy-four percent (74%) of which are metered and twenty-six percent (26%) unmetered.

Address: Head Office: 28th February Road (near Independence Square)
Postal Address: Post Office Box M 194, Accra - Ghana
Telephone: 0207385088, 0207385089, 0207385090, 0302-2218240
Email: info@gwcl.com.gh
Website: www.gwcl.com.gh

Community Water & Sanitation Agency (CWSA)

The Community Water and Sanitation Agency (CWSA), is committed to effective facilitation of the provision of sustainable potable water and related sanitation services as well as hygiene promotion to rural communities and small towns through resource mobilization, capacity building and standards setting with the active participation of major stakeholders.

Address: Off the Legon-Tetteh Quarshie Road about 1km drive
along the Standards Board/Gulf House road
Adjacent to the Dept. of Rural Housing, Okponglo.
Telephone: 0302 983104. 518401(3)
Email: info@cwsa.gov.gh
Website: http://www.cwsa.gov.gh

The Ghana Standards Authority (GSA)

Ghana Standards Authority is an Agency of Government responsible for developing, publishing and promoting standards in the country. It does this through standardization, metrology and conformity assessment activities. Some of these activities are testing, inspection and certification. These activities ensure that products or goods and services produced in Ghana, whether for local consumption or for export are safe, reliable and are of good quality. The Ghana Standards Authority (GSA) sets drinking water standards for water services in Ghana (MWRWH 2014)

Address: P.O Box MB245, Accra
Telephone: 00233-302 506991-5 / 500065/6
E-mail: gsanep@gsa.gov.gh/gsadir@gsa.gov.gh
Website: www.gsa.gov.gh

The Environmental Protection Agency (EPA)

The mission of the EPA of Ghana is to co-manage, protect and enhance the country's environment as well as seek common solutions to global environmental problems. The accomplishment of the mission is to be achieved inter alia through research, scientific, technological and innovative approaches, good governance and partnerships.

The Environmental Protection Agency (EPA) was established to, amongst others, protect water resources and regulate activities within catchment areas including effluent standards (MWRWH 2007).

Address: P.O. Box M.326 Accra, GR Ghana
Email: info@epa.gov.gh
Website: www.epa.gov.gh
Telephone: 0302 664697-8/0302 662690

The Water Resources Commission (WRC)

The Water Resource Commission (WRC) is responsible for water resources regulation and management, implementing the Integrated Water Resource Management Strategic Plan (2011-2015) (MWRWH 2014) and granting water rights (Government of Ghana 1996).

Address: Leshie Cres, Accra Ghana
Website: www.wrc-gh.org
E-mail: watrecom@wrc-gh.org

Water Research Institute

The Water Research Institute (WRI) is one of the 13 institutes of the Council for Scientific and Industrial Research (CSIR). It was formed in 1996 from the merger of the Institute of Aquatic Biology and the Water Resources Research Institute. WRI has a mandate to conduct research into water and related resources. WRI generates and provides scientific information, strategies and services toward 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.

Address: 2nd CSIR Cl, Accra
Telephone: 233-302) 775351, 775352, 779514, 779515, 775511
Fax: (233-302) 777170, 761031
E-mail: info@csir-water.com
Website: www.csir-water.com

Metropolitan, Municipal and District Assemblies (MMDAs)

The Metropolitan, Municipal and District Assemblies (MMDAs) are the highest local political authorities mandated to provide basic infrastructure and services to support social and economic development. In practice, the MMDAs play a minor role in the urban water supply, which is dominated by the GWCL It should be noted that regional district offices of the GWCL are not accountable to local assemblies, but rather to the GWCL headquarters which operates under the Ministry of Sanitation & Water Resources. Communities participate in planning and managing their water supply systems (e.g. stand-pipes and water kiosks and water resources through their elected Water and Sanitation (WATSAN) Committees, Local Water Boards, Water and Sanitation Development Boards, Unit Committees and Area Councils (MWRWH 2014; Morinville & Harris 2014).

Various research institutions and initiatives, e.g. the Council for Scientific and Industrial Research (CSIR), Water and Sanitation Monitoring Platform, National Learning Alliance, provide critical inputs into policy formulation, planning of water and sanitation services delivery and water resource management
(MoSWR 2014).

Private Sector:

Sewerage Systems Ltd

Sewerage Systems Ghana Limited (SSGL) is a limited liability company incorporated under the laws of Ghana and has been in existence since July 2012. It is an Engineering and Construction Company that focuses on the provision of efficient liquid waste treatment. SSGL is a fully Ghanaian owned company. Since its establishment, SSGL has built two new faecal treatment plants (Lavender Hill Faecal Treatment Plant – Near the Korle Lagoon.

Address: Lavender Hill, James Town - Adjacent Fire Service Training School
Telephone: +233 (0) 30 397 2617 +233 (0) 30 397 3788, +233 (0) 30 397 2617
E-mail: info@seweragesystems.com
Website: www.seweragesystems.com

Voltic

Voltic (GH) Limited, (Voltic) has since 1995 refreshed consumers in Ghana with its Natural Mineral Water and other non-alcoholic beverages. As a unique brand that has remained the market leader for twenty-one years and still counting, Voltic has become a generic name for mineral and bottled water in Ghana through the provision of world-class products known for good quality and natural freshness. With two production plants located in Medie and Akwadum in the Greater Accra and Eastern regions respectively, Voltic directly employs 1000 individuals and many more others through our value chain. The company is also in charge of sales and distribution of club minerals and Betamalt throughout Ghana.

Address: Medie Kotoku Road
Postal Address: Voltic (GH) Limited PMB 200, Accra North, Ghana
Telephone: +233 (0)30 277 4248, +233 (0)30 276 5023, +233 (0)50 151 8960
Email: info@volticghana.com
Website: www.volticghana.com

Bel-Aqua

It took the management of BLOW-CHEM over a year to come out with BEL~AQUA. communicating with water giants all over the world to gain a deep understanding of the most advanced water treatment technology, equipment, and bottling processes, they flew down consultants who were ex-employees of Nestle Pure Life Water to ensure the entire plant was setup with world class standards.

A 14-stage advanced treatment plant was setup. This water is processed through several stages of filtration plus ultra-filtration involving a variety of membranes and physical purification treatments (microfiltration, activated carbon filters, sand filter, ultraviolet light, and ozonation).

Address: Blow-Chem Industries Limited.
Plot No. IND/A68/3&12, Kpone Police Barrier,
Aflao Road-Kpone Tema
Telephone: +233 544 335800 / 900
E-mail: info@blowgroup.com
Website: www.blowgroup.com

Jekora Ventures

JEKORA VENTURES LTD. (JV Ltd.) came from humble beginnings in 2003 providing cleaning services at the Odornaa main lorry park as a routine maintenance contractor with the Accra Metropolitan Assembly (AMA). With the pillars of diligence and hard work, JV Ltd distinguished itself and expanded into solid waste collection in 2004 as a Solid Waste Contractor responsible for several container sites in the city of Accra. JV Ltd also obtained additional market cleaning jobs at the pedestrian Odornaa Shopping Mall and built a Water Closet (W.C.) Public Toilet facility at Teshie.

Address: Kanfla Close, Accra
Telephone: 028 967 3514
E-mail: info@jekoraventures.com
Website: www.jekoraventures.com

Denys Ghana Limited

Over the last ten years Denys has evolved into an international group with more than 2500 employees. Denys strives for organic growth, modelled based on three pillars: diversification, innovation and export. In the water sector, they provide the following services.

- Engineering and construction of collectors and sewer systems for waste-water
- Engineering and construction of transport and distribution lines for drinking water and process water
- Engineering and construction of cooling pipes for nuclear power stations, traditional power stations and combined power stations
- Engineering and construction of purification plants for waste-water, drinking water and process water
- Engineering and construction of water towers and reservoirs
- Engineering and construction of pump stations
- Engineering and construction of irrigation systems.

Address: Sir Arku Korsah Road, Airport Residential Area, Accra
Postal Address: P.O. Box KIA 30572 37,
Telephone: +233 302 783 115/6

Delin Consult

Delin Consult is a multi-disciplinary engineering firm that provides technical, financial, institutional, and management consulting services to both private and public sectors of Ghana and the Sub-Saharan Africa. Delin Consult's objective is to establish a development partnership with Clients, and to place at their disposal our knowledge and experience acquired through our involvement in various types of engineering projects. Our quality guarantee is ensured through the personal involvement of our senior partners in every project.

Address: Second Floor, Diamond House, Treasury Link, off Kinbu Road, Accra.
Postal Address: PMB TUC Post Office, Accra, Ghana
Telephone: +233 302 682417, + 233 302 682418
Email: delin@delincl.com
Website: www.delincl.com

ABP Consult LTD

ABP Consult Ltd., as one of the leading private consulting firms in Ghana, provides efficient and high-quality engineering consultancy services to private, public and international institutions, thereby contributing to the development of the nation and the sub-region. ABP Consult Limited was incorporated in Ghana as a Limited Liability Company 1992 having previously operated as a Partnership with the name Asafo-Boakye and Partners from 1969 to 1992.

Address: No. 10 Switchback Link, West Cantonments, Accra
Telephone: +233 302773078, +233 302773081
Email: abp@abpconsult.com
Website: www.apbconsult.com

Jospong Group of Companies

The Jospong Group of Companies is one of the most diversified holdings companies in Ghana with operations in other African countries and Asia. The company has business interest in about 12 sectors of the economy with its biggest operations in Waste management, ICT and Banking as well as Automobile and Equipment. Established in 1995, as a printing press, the company has since its inception experienced phenomenal growth and now has operations covering diverse sectors with over 40 companies with a focus on delivery quality services and products using simple technology at competitive prices. Jospong Group's core business is to identify gaps, churn out innovative businesses and build capacities to provide value and nurture them to become market leaders; fit to play on both the local and international markets.

Address: 3rd Floor (Administration Block)
KNUST - Africa Institute of Sanitation & Waste Management,
Nmai Djorn Near Zoomlion Head Office, Accra, Ghana
Telephone: +233 (0) 544326770,
Fax: 233 (0) 302734588
Email: info@jospongroup.com
Website: www.jospongroup.com

Tovila Water Solutions

Tovila Water Solutions is a leading water solution consultancy firm specializing in the field of research and all water treatment and engineering services with our primary aim to ensure that only quality water is available to all and sundry in Ghana on a sustainable basis for a healthy living to increase productivity for accelerated development.

Address: Tetegu, Accra- Ghana
Telephone: +233 50 1336289 / +233 50 1336290
Mobile: +233 245302321whatsApp: +233 23 3302321
E-Mail: info@tovilawatersolutions.com
Website: www.tovilawatersolutions.com

Safi Sana

Safi Sana is a Dutch holding enterprise that designs, constructs and operates waste-to-energy factories in developing countries. Each factory is a standalone entity which receives support from the Safi Sana technical and marketing servicing team for Quality Assurance.

Address: 1 kilometer from Tema-Motorway under bridge, Adjei-Kojo Ashaiman
Postal Address: P. O. Box CT 8312, Cantonments Accra Ghana.
Telephone: +233 (0) 302972380
www.safisana.org

Water Aid Ghana

WaterAid is an international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene education to the world's poorest people. WaterAid's vision is of a world where everyone has access to safe water and effective sanitation. The Ghana programme was established in 1985 and it has since been operating through partnerships with local NGOs. These NGOs, eight of them at the moment, perform the day to day implementation and project management functions while WaterAid provides financial and technical support. WaterAid Ghana now has projects in seven out of the ten regions in Ghana.

Address: No. 1 Kwabena Anafi Street, Forest Avenue, Dzorwulu
Postal Address: P. O. Box 16185 KIA
Telephone: +233 21 760440 or 780581
Email: info@wateraidghana.org
Website: http://www.wateraid.org/ghana

Safe Water Network

Operating at scale in both Ghana and India, Safe Water Network is demonstrating a cost-effective approach for locally owned and operated small water enterprises to reach millions in need of safe water around the world. Working with other implementers and agencies, they are developing the tools and resources for replication and advancing the case for funding and policy reforms that will enable scale-up. Their team brings together expertise in engineering, operations, finance, health, policy, and social development, and draws upon work experience from world-class multi-nationals, government agencies, and not-for-profits. With more than 60 'H2OME' water enterprises providing access to nearly 300 communities across five regions in Ghana, Safe Water Network is attracting blended financing (including private sector capital), facilitating public-private partnerships, and bringing together government ministries and other stakeholders through a collaborative working group.

Address: 4 Odoi Beyeden Street, East Legon Accra, Ghana
Telephone: +233 302-506-497
Email: ghana@safewaternetwork.org
Website: www.safewaternetwork.org

Water & Sanitation for the Urban Poor (WSUP)

WSUP is a non- profit partnership between the private sector, NGO's and research institutions focused on solving the global problem of inadequate water and sanitation in low income urban communities. WSUP brings lasting solution to low income areas by working in partnership with service providers including water utilities, local authorities and businesses. The key partners of WSUP related to water are Ga west Municipal Assembly, Ghana Water company Limited. Their work is supporting partners to reach the isolated, to include the disadvantaged, and to advocate for the rights of the voiceless. As a result, their work is focused on the poorest regions of Ghana, working with the most disadvantaged communities, and advocating for national policies that enable the poorest to engage and be protected. Our programme covers five main areas:

- Health and Nutrition
- Water and Sanitation
- Education
- Child protection
- Social Policy and Equity

Address: WSUP Ghana, House NO. 403/16
Nii Noi Kwame Street, Dzorwulu,
P.O. Box 1303
Achimota, Accra, Ghana.
Telephone: 030 290 0435
Email: erl@wsup.com
Website: www.wsup.com

IRC Wash

IRC and the Government of Ghana have agreed to step up moves to strengthen WASH systems in the country over the next four years through the IRC Ghana Strategy 2017-2021
During this period IRC Ghana will focus on:

- Support to strengthen country WASH systems;
- Demonstrating proven and promising solutions and models for SDG 6 in focus districts, strengthening the capacity of local government to apply the service delivery model;
- Leveraging partnerships and networks to improve WASH delivery;
- Building credible and actionable evidence and fostering sector learning and dialogues

Strengthening the capacity of civil society organizations (CSOs) to build popular support and lobby for transparency in WASH service delivery. Ghana

Address: Plot no.61 at no.18, Third Close, Airport Residential Area, Accra, Ghana
Telephone: +233 302 797 473, +233 302 797 474
Email: ghana@ircwash.org
Website: www.ircwash.org

CONIWAS

The Coalition of NGOs in Water and Sanitation (**CONIWAS**) was formed to act as a body with a unified voice, capable of mobilizing sector actors for actions that are non-confrontational but capable of resolving sector concerns. Giving the NGOs one voice for advocacy and lobbying has been one major benefit to the coalition. CONIWAS has the following vision and mission: Water, Sanitation and Hygiene for All for Development through Collective Action. The Mission is to "Work in Partnership with sector players to influence policies, remove barriers and promote access to potable water, sanitation and improved hygiene for the poor and vulnerable. Their major partners include most of the Donor agencies like DANIDA, CIDA, European Union, WaterAid Ghana, UNICEF amongst others.

Postal Address: PMB KA 24 Airport, Accra – Ghana.
Telephone: +233 (244) 989 085
Website: www.coniwasghana.org
Email: coniwas@yahoo.com
info@coniwas.org

Water Health Ghana

Water Health Ghana (WHG), which is a wholly owned subsidiary of WaterHealth International, was established in 2008 with a vision to provide safe, scalable and affordable drinking water to the underserved communities across Ghana. Since then, WHG has successfully installed over 50 WaterHealth Centers (WHCs) across 7 regions of Ghana. The organization has also partnered with RVO (Netherlands Enterprise Agency) for 85 WHCs under Ghana Wash Window (GWW) program. Close to 0.50 million people have access to safe water due to the network of WHCs in Ghana. WaterHealth Ghana had also ventured into sachet business under the brand name 'dr. water' to meet the demand of safe, affordable and potable drinking water for Ghanaian consumers. The company had collaborated with local entrepreneurs for manufacturing and distribution of sachet water and has successfully rolled out 'dr. water' sachet in 500 ml packaging.

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Postal Address: PMB KA 170 Airport
Accra, Ghana.
Email: infoghana@waterhealth.com
Website: www.waterhealth.com

UNICEF

UNICEF's on-ground interventions include the installation of water wells and implementing behavioral change strategies to improve uptake of sanitation and hand washing behaviors, based on Community Led Total Sanitation (CLTS) as the primary strategy in Ghana. UNICEF's approach recognizes the need to move from a culture of dependence, based on subsidies, to a behavioral change approach where people choose to stop open defecation.

The enabling environment for improved water, sanitation and hygiene in Ghana includes support for the development and implementation of national forums, strategies and policies. Key strategies include national training and empowerment initiatives, with a particular focus on engaging women and girls in water and sanitation governance.

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Postal Address: P.O. Box. AN 5051
Telephone: +233 302 772524, +233 244 337513
Website: www.unicef.org/ghana

International Water Management Institute (IMWI)

The International Water Management Institute (IWMI) conducts research for development through programs whose purpose is to build an evidence base for new approaches that address key water-related challenges:

- Building Resilience
- Sustainable Growth
- Rural-Urban Linkages

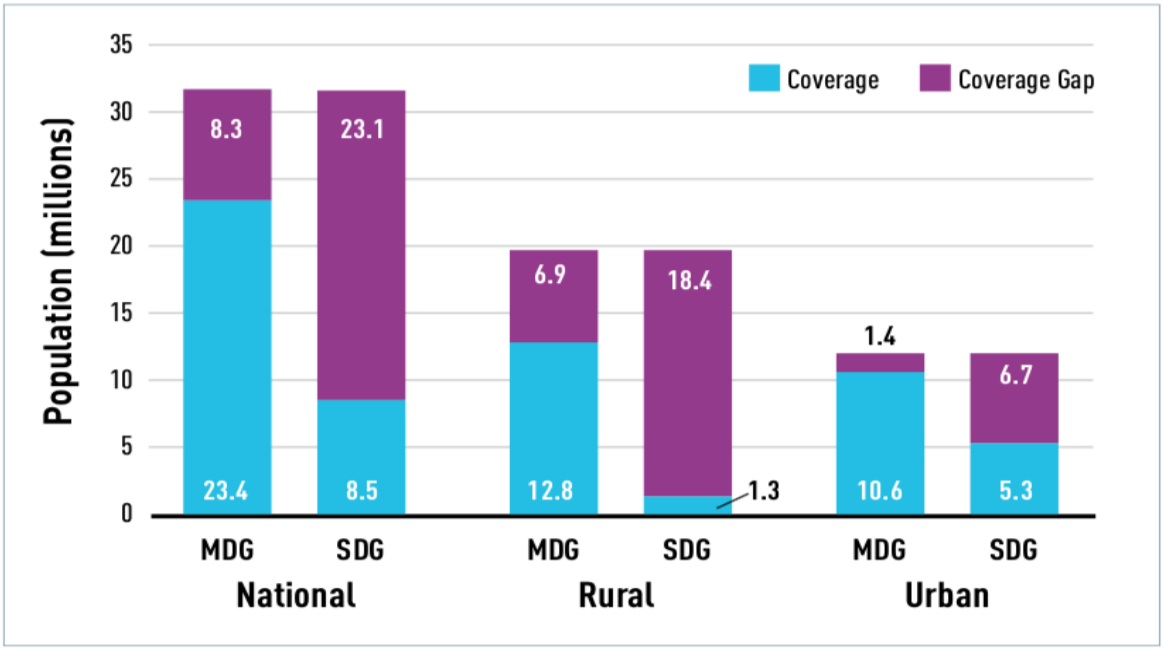
Address: IWMI c/o CSIR Main Campus, Airport Residential Area (opposite Chinese Embassy), Accra, Ghana
Postal Address: IWMI, PMB CT 112; Cantonments, Accra; Ghana
Telephone +233 (0)30 2784753/4 or +233 289 109561/+233 544 088 277
Fax: +233 (0) 302 784 752
E-mail: iwmi-ghana@cgiar.org

5. Drinking Water Coverage and Supply in Ghana [21]

Unclean drinking water and inadequate water disposal lead to serious environmental and health problems in Ghana. In the Millennium Development Goals (MDGs) of the United Nations (UN), access to clean drinking water was set as the target for 77% of the population. Although 82% of the population in Ghana has access to clean drinking water and the goal has been achieved, the consequences of unsafe drinking water are still devastating. Especially in rural areas, access to safe drinking water is not guaranteed. In the "Northern Region" of Ghana, about 800,000 people consume unclean drinking water. According to estimates by www.water.org (water.org)[22], about 70% of all illnesses in Ghana are due to polluted drinking water and inadequate sanitation.

8.3 million people lack access to a basic drinking water service, while 23.1 million people (73% of Ghana's population) lack access to a safely managed service that provides on-premises, reliable, and contaminant-free drinking water. Most of those without access to basic or safely managed drinking water live in rural areas (Figure 3).

Figure 3: Drinking Water Coverage in Ghana



Source: Safe Water Network, Ghana Sector Review 2017

5.1 Rural and Urban Service Coverage

18.4 million people living in rural areas[23] and 6.7 million people living in urban areas[24] lack access to safely managed drinking water.[3] Almost 20 million Ghanaians (predominantly those in rural areas and small towns) are within the operational area of Ghana's Community Water and Sanitation Agency (CWSA) while 12 million (predominantly urban) are within the Ghana Water Company Limited's (GWCL) operational area. While not

[21] Safe Water Network, Ghana Sector Review, Scaling Small Water Enterprises August 2017

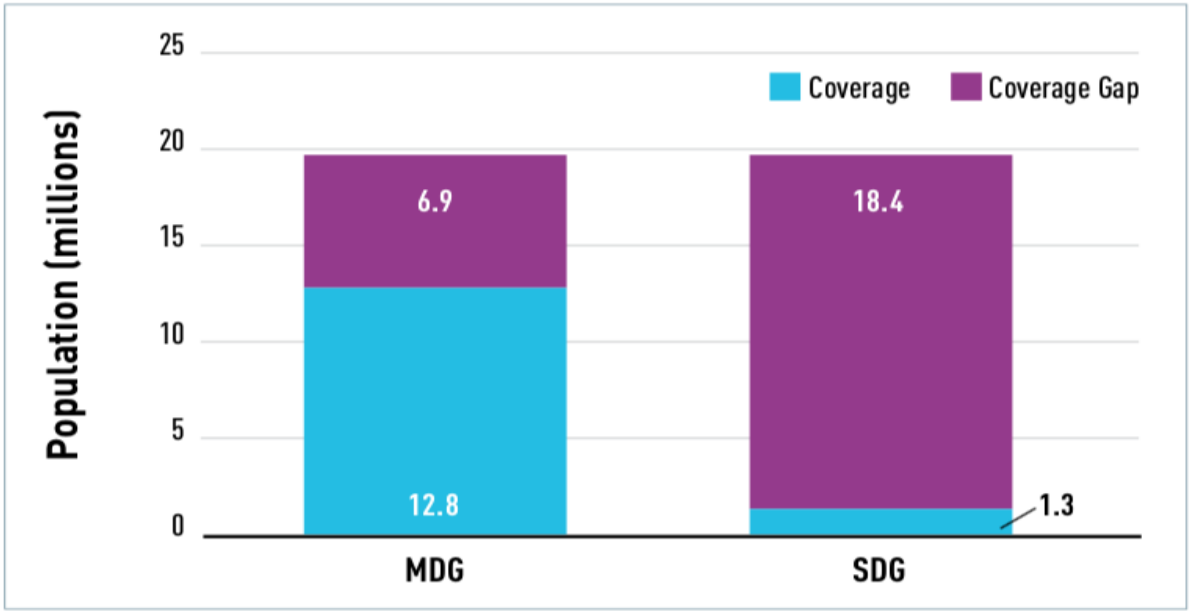
[22] Water. Org Ghana's Water & Sanitation Crisis

[23] Rural population is based on CWSA coverage area of 19.7 million people. JMP estimates for proportion of rural population without access to safely managed drinking was used

[24] Urban population is based on GWCL coverage area of 12 million people. JMP estimates for proportion of rural population without access to safely managed drinking water was used

exactly equivalent, for the remainder of the report "rural" indicates areas that are CWSA's responsibility, and "urban" indicates areas that are GWCL's responsibility. Coverage in rural areas remained steady at 64% from 2012 to 2014, with a slight increase to 65% in 2015. This increase was a result of the completion of existing projects in 2015 in rural areas and small towns. The number of people covered is expected to remain about the same in the coming years due to a potential reduction in grant funding to the sub sector because of Ghana's attainment of lower-middle income status.[25] these leaves 6.9 million people in rural areas without access to basic drinking water services, and 18.4 million people in rural areas without access to safely managed drinking water (Figure 4).

Figure 4: Rural Access to Water Services

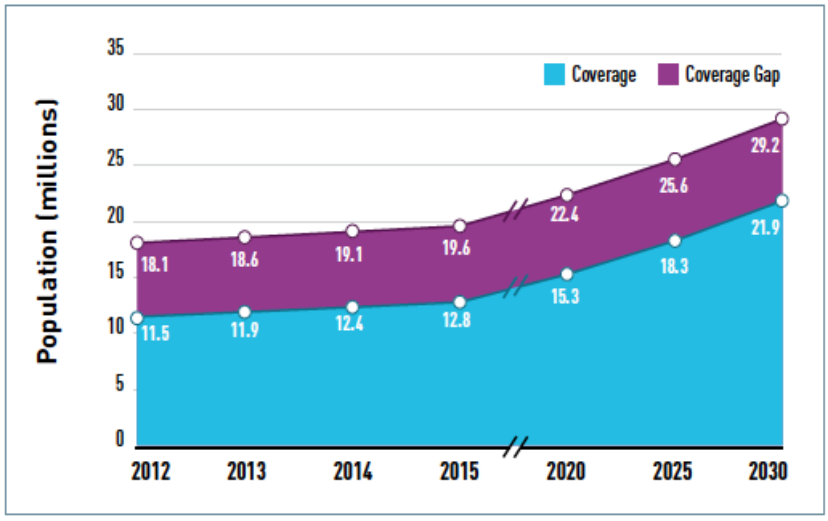


Source: Safe Water Network, Ghana Sector Review 2017

[25] The lower-middle income status of Ghana makes the country unattractive for grants and so the country would have to apply for loans; however, if loans are to be given out, the lender has to make sure that the country could cover the loans but there is no evidence that a high return can be generated in a social service like water.

If the rate of increase in coverage observed between 2012 and 2015 remains the same, universal access to basic drinking water in rural areas will remain an ambitious and unmet goal even after 2030
(Figure 5).

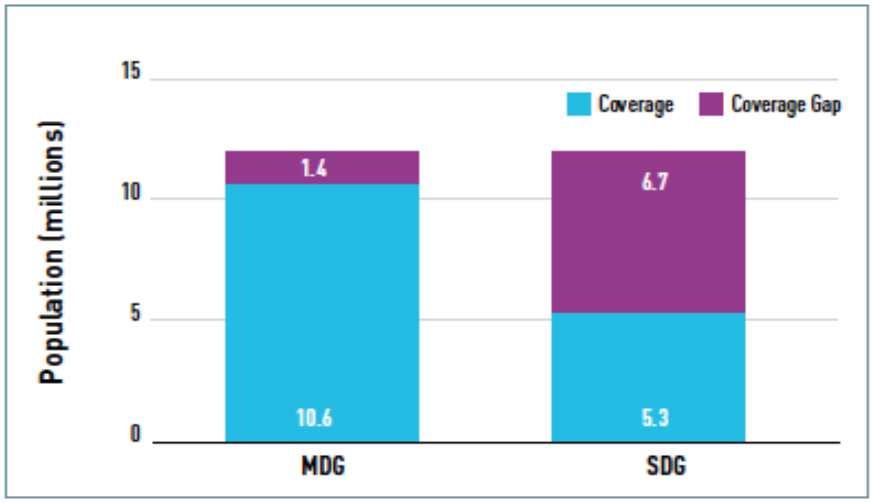
Figure 5: Projected Trend in Access in Rural Areas at Current



Source: Safe Water Network, Ghana Sector Review 2017

In urban areas, populations with access to basic drinking water services increased between 2013 and 2015, with the highest coverage being 88% in 2015, representing 3.5 million additional people covered compared to 2014.8 This vast increase was a result of the completion of major urban water rehabilitation and expansion works. However, 1.4 million people in urban areas still lack access to basic drinking water services, and 6.7 million lack access to safely managed drinking water (Figure 6). Many of those without access to basic and safely managed drinking water live in peri-urban areas and slums, which are difficult for traditional utilities to reach. The significant increase in coverage between 2014 and 2015 was inconsistent with previous years; there is insufficient data to determine if this increase occurs periodically or if it was an anomaly. As a result, we do not estimate coverage in future years.

Figure 6: Urban Access to Drinking Water Services



Source: Safe Water Network, Ghana Sector Review 2017

6. Opportunity for Small Water Enterprises[26]

The GoG has prioritized safe water for all and there is a growing interest in public private partnerships. This presents an opportunity for SWEs to make significant contributions to the water sector in Ghana. According to the Water Sector Strategic Development Plan (WSSDP) for 2012-2025, the GoG's vision for the country is sustainable water for all by 2025. GoG realizes that to achieve this vision, decentralized service delivery is needed and appreciates the contributions made by secondary and tertiary service providers.

Specifically, for peri-urban and low-income communities, where SWEs are most appropriate, one of the viable management options being considered are private operator management of a water facility, such as a small water enterprise. GoG has also developed a framework for private sector participation in the water sector that defines measures to encourage private sector participation in water service delivery. The strategies and plans outlined in the WSSDP illustrate the opportunity for SWEs to contribute to GoG's vision of sustainable water for all by 2025.

6.1 Drinking Water Service Providers[27]

The public sector—local government authorities or GWCL—directly owns or operates the majority of water systems in Ghana and serves over 23 million of the population. Over the past five years, SWEs have begun to serve an increasing portion of the remaining population. This increase is encouraging, but SWEs are yet to achieve scale. While the number of SWE systems has almost doubled in the last year (from 65 to 114 systems), as has the number of people they serve (from 700,000 to 1.1 million), there remains a major portion of the population that is not served. It is projected that 185+ SWEs will provide access to almost 1.4 million people by the end of 2017. Despite this progress, there is a need for a dramatic increase in coverage above current trends. Details on water service providers are provided in Table 6

Table 6: Key Water Service Providers in Ghana [28]

Actors	Provision model	Scale of provision in 2016	
		# of systems	# of people served
Urban areas[f]			
GWCL	Urban utility	82 systems	10.6 million
Rural areas including peri-urban and small towns[g]			
Local Government Plants	Utility	350+ systems	Unknown
Safe Water Network	Micro utility	58+ systems	298,000+
WaterHealth Ghana	Water kiosk	44+ systems	800,000
Project Maji	Water kiosk	3 systems	12,000
Local Government Plants	Utility	35,000+ wells	Unknown
Saha Global[h]	Water businesses	100+ businesses	52,000

Source: Safe Water Network, Ghana Sector Review 2017

[26] Ibid

[27] This report, we define drinking water service providers as individuals or organizations that operate water systems that treat and store water and have a distribution mechanism that that enables water collection either in-home or outside the home. Although not included in the definition of drinking water service providers, water provision by tanker trucks and other delivery mechanisms have been substantial enough for GWCL to establish designated collection points where water can be drawn legally, and for the Public Utilities Regulatory Commission (PURC) to develop guidelines for tanker trucks to ensure safe water provision.

[28] This is not an exhaustive list. It focuses on the main providers (CWSA and GWCL) and Community Water System Providers

Table 7: Characteristics of the Two Main SWE Implementers in Ghana

Organization	Safe Water Network	WaterHealth Ghana
Description	Safe Water Network is a **non-profit** organization that provides safe drinking water to ***low-income* communities in *rural areas,* including *peri-urban.*** **Safe Water Network engages other sector stakeholders to influence policy and attract funding to the sector** to enable scale.	WaterHealth Ghana is a **for-profit** social enterprise that provides safe drinking water to *middle and high income* communities that have limited access to safe drinking water. WaterHealth Ghana operates primarily in ***urban areas.***
Year founded	2006 (2009 in Ghana)	2006
Number of systems in 2017	67	47
Model	Community enterprises	Enterprises
Brand	H20ME!	dr. water
Price / 20 liters water (Bulk)	USD 0.03–0.09 (GHS 12p-30p)	USD 0.07–0.45 (GHS 30p-200p)
Price / 20 liters water (Packaged)[a]	Not applicable	USD 5.70 (GHS 2500p)
Treatment technologies	Limited mechanization and slow sand filtration	Reverse osmosis and ultra-violet filtration
Distribution mechanisms	Standpipes/kiosks, bulk/truck delivery, household connections	Bubble top, standpipes/kiosk

Source: Safe Water Network, Ghana Sector Review 2017

Over the past five years, there have been two major players in the SWE sector in Ghana: Safe Water Network (SWN) and WaterHealth Ghana (WHG) that provide safe drinking water populations that have limited access to safe drinking water (Table 6). Although the total number of water points provided by these organizations has increased, no other major SWE players have entered the country. With Safe Water Network implementing 67 SWEs in 96 communities; and WaterHealth launching 47 SWEs, these two organizations – combined – have implemented over 114 SWEs in total in Ghana, providing safe water access to 150 communities.

6.2 Populations that SWEs Can Serve

SWEs could serve 3.2 million people (846 communities) a of the 6.9 million in rural areas that lack access to basic water services, on a financially sustainable basis without subsidies. Conservatively, an additional 1.6 million could be served by utilizing subsidies. SWEs could also enable many of the 11.5 million people in rural areas with basic drinking water services to upgrade to safely managed services.

SWEs can reach those who are not served by either traditional urban infrastructure or basic technologies such as handpumps that typically reach remote villages with limited economic activity. SWEs could potentially serve 4.8 million people; this still leaves 2.1 million people in rural areas without access to basic drinking water. There is insufficient data to estimate the number of people that have access to basic services but lack access to safely managed drinking water that SWEs can serve; however, we anticipate SWEs can serve millions of this population.

SWEs could also reach a portion of 1.4 million people in urban areas that currently lack access to basic drinking water services. However, these are within the GWCL operational service areas. While we see potential for SWEs to supplement water provision by utilities, GWCL's area is exclusively served by the utility. The estimated market for SWEs in rural areas and small towns is shown in Table 7

Table 8: Market size for SWEs in rural Ghana

Area	Total	Total without access to basic	Total without access to safely managed [h]	Market size for SWEs without subsidies	Additional market size for SWEs with subsidies	Total market for SWEs	SWE market as percent of Total	SWE market as percent of Total without access to basic
Communities	25,890	9,216	Not available	846	1,458	2,304	8.9%	25%
Population	19,718,525	6,892,847	Not available	3,200,761	1,625,085	4,825,846	24.5%	70%

Source: Safe Water Network, Ghana Sector Review 2017

6.3. Ongoing Activities that are Addressing Barriers to SWE Scale-up

Players in the SWE sector in Ghana have developed and implemented effective approaches to impact the barriers that hinder the growth of SWEs. The GoG is developing a new five-year strategic plan for Ghana's water and sanitation sector. The plan will, among other things, focus on creating an enabling environment for public private partnerships and increased investment in water supply in peri-urban water supply. This could potentially support development of SWEs. In addition, innovative approaches are being developed to improve cost-effectiveness, keep prices affordable for the poor while ensuring financial viability and sustainability, and attract funding to the sector. Some examples include:

- **Solar:** the use of solar panels to minimize electricity costs and improve financial viability of SWEs;
- **Any Time Water Machines (ATMs):** the introduction of ATMs to increase convenience of water collection, thereby increasing consumer access and penetration;
- **Ghana Water Enterprise Trust:** The Trust, an entity (in development) that can provide the governance and structure required to attract financing from the public and private sectors;
- **Pre-Paid Meters:** the introduction of prepaid meters for household connections to reduce the high operational cost of revenue collection, reduce default rate, and improve system financial viability and revenue predictability;
- **Mobile money:** testing the potential of mobile money integration into water sales to reduce transaction costs and improve revenue mobilization for SWEs.

7. Legislative and Policy Framework for Water Service Provision in Ghana[29]

Since the early 1990s, Ghana's water and sanitation sector has seen major reforms to address weaknesses. Appropriate institutional, legal, and regulatory structures are now largely in place, particularly for the urban and rural water supply subsectors. The Ministry of Sanitation & Water Resources has provided leadership in drinking water supply, kept to policy formulation, and encouraged and supported the agencies under it to perform their roles. There are clear lines of responsibility and all subsector policies have been consolidated into the National Water Policy (NWP) and the National Environmental Sanitation Policy. The Environmental Health and Sanitation Directorate (EHSD) within the Ministry of Local Government and Rural Development (MLGRD), recently upgraded to a directorate, has taken on a leadership role for sanitation in Ghana. Yet considerable efforts are still required in the sanitation subsectors, not the least of which is to strengthen EHSD's capacity. Whilst the enabling environment has been largely created, developing and sustaining service delivery presently needs greater emphasis. Data reported by the 2010 UNICEF/WHO Joint Monitoring

Water and sanitation have been important components of national policies and plans in Ghana. They have been understood and recognized as key pillars of its economic and social development. The latest national Medium-Term Development Programme (MTDP) and the Ghana Shared Growth and Development Agenda (GSGDA-II) for the period 2014-2017 are policy frameworks prepared by the Government of Ghana (GoG), which explicitly focus on rural and urban water provision though strengthening Public-Private Partnerships (PPPs) and measures for effective operation, maintenance and systematic upgrading of water facilities (GoG, 2014a).

Ghana's water and sanitation sectors have undergone major reforms since the 1990s, with the support of international multilateral and bilateral donors. Today, according to the 2011 assessment conducted by the African Ministerial Conference on Water (AMCOW), Ghana has appropriate institutional, legal and regulatory structures and frameworks in place particularly for the urban and rural water supply sub-sectors (World Bank, 2011).

The Ministry of Sanitation & Water Resources (MoSWR) has provided leadership around drinking water supply, through policy formulation and support to the agencies under the Ministry to perform their roles. There are clear lines of responsibility and all sub-sector policies have been consolidated into the National Water Policy (NWP) of 2007 (see Box 3) and the National Environmental Sanitation Policy of 1999 (revised in 2010).

The advent of the MDGs in 2000 galvanized efforts towards improving human development and quality of life through basic service delivery, with an accent on drinking water and sanitation. In 2010, the GoG released the Ghana Compact a framework for action towards sanitation and water for all' (GoG, 2010). The Ghana Compact declared sanitation and water as priority sectors to achieve the MDGs, and endeavored to prioritize institutional capacity building and investments in the sector through an integrated planning process and targeting the unserved (GoG, 2010). To operationalize the Ghana Compact, the GoG approved the Water Sector Strategic Development Plan (WSSDP) for the period 2012-2025.

7.1 The Enabling Environment for the Water Sector in Ghana.

Within the overall framework of the 1992 Constitution, the policy framework for water resources management and development in Ghana is anchored on two essential documents: i.e. the WRC Act 522 of 1996 and the National Water Policy (NWP) of 2007. The WRC Act clearly defines the WRC as the overall responsible body for water resources management in Ghana and is specifically mandated to:

- regulate and manage the country's water resources; and
- co-ordinate government policies in relation to them

[29] National Integrated Water Resources Management Plan (IWRM) 2012

Similarly, the NWP clearly proposes IWRM approach for water resources management in Ghana and underscores the focus on the following principles:

- the principle of meeting the social needs for water as a priority, while recognizing the economic value of water and the goods and services it provides;
- the precautionary principle that seeks to minimize activities that have the potential to negatively affect the integrity of all water resources;
- the principle of polluter pays, to serve as a disincentive to uncontrolled discharge of pollutants into the environment;
- the principle of subsidiarity to ensure participatory decision-making at the lowest appropriate level in society;
- the principle of solidarity, expressing profound human companionship for common problems related to water;
- the principle that international cooperation is essential for sustainable development of shared basins;
- the principle of the greatest common good to society in prioritizing conflicting uses of water;
- the principle of improving equity and gender sensitivity.

Other documents that complement the WRC Act and the NWP are legislative instruments, regulations and guidelines that address specific areas and issues of the entire water sector. Some of the specific areas and issues and their relevant laws are:

- **Ownership and Riparian Rights:** it falls within the provisions of Article 269 of Ghana's Constitution, which seeks to protect water resources by setting up a Commission to regulate, manage and coordinate Government policies in relation to it.

- **Water Abstraction, Diversion and Damming**: This is under the Water Use Regulations 2001 (L.I. 1692) and provides procedures for allocating permits for various water uses including domestic, commercial, municipal, industrial, agricultural, power generation, water transportation, fisheries (aquaculture), environmental, recreational and under water wood harvesting. In 2006, the Drillers License and Groundwater Development Regulations were promulgated.

- **Drinking Water Tariffs and Efficiency:** The Public Utilities Regulatory Commission (PURC) Act 538 of 1997 set up the PURC and conferred on it the mandate to regulate standards of utility services including the tariffs set by the Ghana Water Company Limited (GWCL) for urban water supply, the quality of drinking water provided by the company, ensure proper water industry practices, and protect the interests of consumers.

- **Drinking Water Quality Standards:** The Ghana Standards Board (GSB) issues Drinking Water Quality Standards and sampling procedures covering the quality of water supplied by public water utilities.

- **Effluents and Waste Discharges:** The WRC and the Environmental Protection Agency (EPA) control the pollution and effluent discharges into water bodies. EPA, through its Environmental Assessment Regulations of 1999 (L.I. 1652) defines procedures for acquiring environmental permits and conducting Environmental Impacts Assessments (EIA) for development projects that have or are likely to have adverse effects on the environment including water resources.

7.2 International Agreements

Ghana is signatory to several international laws, protocols, agreements and declarations that place obligations on the government in the management of water resources and the environment. Some of the international water and environmental laws, protocols and agreements signed and ratified by Ghana include the following:

- United Nations Convention on the Law of the Sea, 7 June 1983
- Convention on Wetlands of International Importance Especially as Waterfowl Habitats: Ramsar Convention, 22 February 1988
- Convention on Biological Diversity, 29 August 1994
- United Nations Framework Convention on Climate Change, 6 September 1995

- United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, 27 December 1996
- The Ouagadougou Ministerial Statement on IWRM March 1998
- Ghana–Burkina Faso Joint Declaration on improved management of the natural resources of the Volta Basin, April 2004
- Resolution for the establishment of a Volta Basin Technical Committee, July 2004
- Convention setting up the Volta Basin Authority, August 2009.

While Ghana is yet to ratify the UN Convention on the Law of Non-Navigational Uses of International Watercourses (May 1997), most of the IWRM principles in the NWP draw on the articles of the Convention.

Ghana also belongs to regional and sub-regional organizations such as: The West African Water Partnership of the Global Water Partnership (GWP/WAWP); the African Ministers' Council on Water (AMCOW); the Permanent Framework for Coordination and Monitoring (PFCM) of IWRM under ECOWAS; and the six-nation Volta Basin Authority (VBA). However, Ghana still needs to establish trans-boundary river basin arrangements with Côte d'Ivoire on the shared Tano/Bia catchments and with Togo on the Oti catchment.

8. Overview of the Wastewater Sector in Ghana[30][31]

Ghana has a very low coverage for wastewater and faecal sludge treatment which is mostly sewerage systems. The national average for sewerage coverage is as low as 4.5%. Tema is the only municipality with a comprehensive sewerage system. Accra has a sewerage system covering the State House and ministries area and parts of the Central Business District with low property connections. There are also several satellite sewerage systems for Dansoman, Teshie-Nungua, Burma Camp, University of Ghana, Legon, Achimota School, 37 Military Hospital and Ridge areas. The treatment facilities for both the Accra and Tema systems have broken down and not in use.

8.1 Ho Municipal Assembly

There is one waste water treatment plant in the Ho Municipality. The treatment plant is an Activated sludge system for treating waste from military barracks. The treatment units consist of a Sewage Pumping Station, two aeration tanks, sludge consolidation tank/thickener and treated water contact tank. The treatment system is functioning and managed by the military. Currently faecal sludge from the municipality is dumped in the wood lands at Tsito. Figure 7 shows various components of the wastewater treatment plant at Ho.

Figure 7 Components of the Wastewater Treatment Plant in Ho

Source: UNICEF Assessment of Wastewater treatment plants in Ghana, July 2016

8.2 Ashaiman Municipal Assembly

In the Municipality, it is reported that, there is a treatment facility which collects waste from the sewered portion of Ashaiman. There is also a waste to energy / Biofertilizer plant designed for co-digestion of municipal solid waste and faecal sludge, which is currently under construction. The bio fertilizer system consists of mixing tanks, digester, drying

[30] GSS (2013) 2010 Population and Housing Census, Ghana Statistical Service National Analytical Report, Ghana Statistical Service.

[31] WHO/UNICEF (2015) Progress on sanitation and drinking water – 2015 update and MDG assessment, UNICEF and World Health Organization 2015.

beds, duck weed pond, constructed wetland and waste stabilization ponds. The plant is being managed by Safi Sana Ghana Limited. Faecal sludge from Ashaiman is currently dumped at a facility in Nungua.

Figure 8: Stages of construction of Waste to energy plant in Ashaiman

Figure 8 shows various stages of construction of waste-to-energy plant in Ashaiman.

8.3 Tamale Metropolitan Assembly

In the Tamale Metropolitan Assembly, there are three (3) wastewater/faecal sludge treatment facilities which are all operational. The treatment plants are waste stabilization pond, septic tanks with constructed wetlands and liter systems.

Source: UNICEF Assessment of Wastewater treatment plants in Ghana, July 2016

Waste Stabilization ponds for treating faecal sludge and leachate from adjacent engineered land ll. is made up of Anaerobic Ponds, Facultative Ponds and Maturation Ponds. The ponds usually dry up during the dry season. The systems appear to be overdesigned or does not receive enough faecal sludge to treat. The system is managed by Zoomlion Ghana Limited. There are several septic tanks with constructed wet lands treating wastewater from SSNIT housing units. At the time of the assessment the wetlands were overgrown with weeds. During the dry season the wetlands also dry up.

At the Military barracks, there is a filter bed with sludge drying beds treating wastewater. These systems consist of Primary settling tank, Filter bed and Sludge drying beds. The wastewater from the primary settling tank has been diverted directly into an earth drain and used by vegetable farmers. So, the liter bed has been by passed.

Figure 9: State of various components of Waste Stabilization Ponds

Figure 10: Waste Water Treatment System for Military Barracks in Tamale

Figure 11: Septic Tank Systems for SSNIT area in Tamale

The system is managed by the military. Figures, 9, 10 & 11 shows the various components of waste stabilization ponds, septic tanks systems for SSNIT area and treatment systems for the barracks respectively in Tamale. The assessment revealed that most of the existing wastewater/faecal sludge treatment facilities are in a poor state. There is the need to pay attention to operations and maintenance of waste water and faecal treatment[3233]

[32] World Development Indicators (2016) from the World Bank available at http:// data.worldbank.org/country/Ghana#cp_wdi date assessed on April 2016.

[33] WSP, Water and Sanitation Program (2012). Ghana loses GHC420 million annually due to poor sanitation. In Economic impacts of poor sanitation in African: Water and Sanitation Program

8.4 Jekora Ventures Limited Composite Plant in Borteyman[34]

Jekora Ventures Limited (JVL) has also opened a fortifier production composite plant at Borteyman in the Tema Metropolis to process liquid and solid waste into organic fertilizer. The plant, which has an initial investment cost of 650,000 US Dollars, is to produce 500 metric tonnes of Fortifer annually from 700 metric tonnes of organic waste collected in Accra, and 12,500 metric cubes of faecal sludge. While the organic waste comprised of segregated food waste at source, the one-third of the faecal sludge would come from public toilets and two-thirds from household septic tanks and pits. The plant when operating at full capacity would annually absorb the liquid waste of an equivalent of 65,000 to 100,000 people. The joint partnership between the Tema Metropolitan Assembly and Jakora Ventures Limited is the country's first public-private partnership dedicated to producing an affordable new organic fertilizer called Fortifer.

Figure 12: Jekora Ventures Composite Plant in Borteyman

Source: Press Release, Radio Gold May 2017

[34] News Article from Radio Gold, May 2017

9. Urban Storm Water Solutions

9.1 Introduction

Greater Accra, Ghana, is home to more than 4 million people who repeatedly experience flooding during annual rainy seasons. Due to the dense population, there are hardly any green areas and the sewage system is insufficiently developed, so that the city stands still in a heavy rain fall and in retrospect time must be invested in it to eliminate the damage incurred.

As cities continue to grow, this issue will only become more relevant in the future, and there are now several approaches to reducing the impact of heavy rainfall, particularly by imitating natural rainwater runoff. In Europe, this approach is known as the Sustainable Urban Drainage System (SUDS) and the United States Low-Impact Development (LID) (Zhou 2014, p. 978). In the following, only the term SUDS will be used, but these two terms are generally used interchangeably in this context.

In the past, in contrast to the SUDS methods, centralized built structures were used to collect wastewater. The techniques of the SUDS aim to directly interact with the process by treating the rainwater and its contained pollutants directly at the source. Components of this method are so-called structured and non-structured wastewater solutions. In the following, different structured and non-structured methods will be presented. Before that, however, the current state of Accra's wastewater management is briefly analyzed.

9.2 Situation Description

Currently there are regular floods in Accra during the rainy season, which in addition to the property damage they cause have cost lives in some cases. A big problem is that in many parts of Accra the buildings are not built according to a plan, but where it suits the person building. As a result, the distances between the individual buildings are often too small and water cannot drain but accumulates in the narrow corridors. In addition, the denser the buildings are built, the more water accumulates on the roofs, which are impervious, of the buildings, which also flows into the narrow corridors.

Another problem is the bad drainage system. In Accra, but also in Kumasi and Sekondi-Takoradi, the sewers and their feeds are very often not wide and deep enough to allow the flow of water. This causes them to overflow and it contributes to the floods. But even if the water can drain through the sewers, this is not further filtered and so the dirt and pollutants from the streets gets into the water, which is then forwarded to larger collection points for rainwater.

The third major problem is that existing structures for wastewater disposal are often heavily polluted and littered. Stones intended to cover the canals are missing in many places, and residents and businesses use the open channels as trashcans and as public bathrooms. As a result, even less water can flow through the channels, which do not have enough capacity even without the refuse, and more pollutants are also released into the water. If the canals now flood in the rain, the collected debris gets back on the streets and dirty them immensely.

The three problems are different from each other but are interwoven and all contribute to the current problems of floods after heavy rains during the rainy season. These problems though can be addressed through non-structural and structural solution. Sometimes the distinction between these two approaches is not very clear as for successful storm water management a mix of both approaches is necessary. In the following the definition of the *New Jersey Storm water Best Management Practices Manual* will be used in case of contradiction

9.3 Non-Structural Solutions

According to the *New Jersey Storm water Best Management Practices Manual* non-structural solutions can be generally grouped into four categories: vegetation and landscaping, minimizing site disturbance, impervious area management and time of concentration modifications. The methods that are used within these four categories will be discussed in the following.

Managing the vegetation at a site can significantly reduce the impact of storm water as it reduces runoff volumes and peaks through infiltration, surface storage, and evapo-transpiration. Additionally, vegetation can reduce the amount of pollution from the water before entering back into the groundwater. To maximize the vegetation first it is important to preserve the already existing natural areas. This is most important for areas that have significant hydrological functions such as forested areas, riparian corridors and high groundwater or aquifer recharge capabilities. It is crucial to ensure that these vegetated sites will also be preserved in the future to ensure a consistent storm water management. Additionally, the amount of lawn should be reduced since research has shown that grass generates more runoff than other types of vegetation. Instead native plants should be used to replant areas since these on the one hand are lower in maintenance and have better hydrological characteristics. Both these vegetated areas will low and filter the water runoff and the water can even be re-infiltrated into the soil

The second category is to minimize land disturbance which can help reduce post-development site runoff volumes and pollutant loads and maintain existing groundwater recharge rates and other hydrologic characteristics. To achieve this, roadways and building patterns should match the existing land forms and thereby reduce the amount of clearing that is necessary for the construction. Another issue that should be considered during land development according to the *Storm water Management Manual for Western Australia* is waste management during construction to control drainage, erosion, sediment loss and dust which could impact the water quality negatively.

The third category is impervious area management, these areas can reduce the volume and peak rate of runoff. One thing to consider for impervious area management are streets and sidewalks. Street widths should be not wider than necessary (considering traffic density etc.) as streets are usually impervious and thereby promote flash floods in case of larger amounts of storm water. To design streets in such a way that there are still areas with pervious materials to receive runoff, for example roundabout or traffic islands can be vegetated. These places provide an opportunity for water to be stored and infiltrated. Sidewalks can be made from pervious material such das porous concrete or pavement to provide runoff storage and infiltration.

These pervious paving materials can be used at many site locations to replace impervious materials and thereby improve the storm water management. Possible locations are parking spaces, driveways, access roadways, sidewalks or other areas which are not too heavily used. Pervious materials are for example pavers, porous pavement, gravel and reinforced lawn. When picking the material, the intensity of use of the material's surface must be considered such as the traffic rate and frequency. Besides managing the runoff, pervious pavements can also control pollutants since the storm water is usually filtered through several layers before entering the groundwater again.

Buildings and their roofs are another large source of impervious areas. To reduce these areas vegetated roofs, also known as green roofs, can be installed. These vegetated roofs consist of a lightweight vegetated planting bed that is installed on a new or existing roof. The roof is now able to retain water which will then later be released through evapotranspiration. When choosing the vegetation for the roof the access to the roof and the maintenance requirements of the roof should be considered. It is sensible to use plants that do not use much fertilization and watering to reduce maintenance to a minimum. Not only flat roofs can be vegetated, but steeper roofs as well. If the roof is steeper they might require protection against erosion.

The fourth category is the time of concentration modifications, which can be defined as the time runoff needs to drain from an area. To increase the water's travel time, it is useful to increase surface roughness by for example preserving and restoring vegetation. Additionally, slopes can be reduced, or terraces installed to achieve this.

The *Storm water Management Manual for Western Australia* additionally considers maintenance practices and educational and participatory. The first point that will be discussed in more depth are maintenance practices. Street sweeping, or cleansing can be used as an effective way thanks to new technologies to reduce the amount of sediments and pollutants that otherwise would end up in the water. Another issue is the maintenance of the storm water network which is as mentioned above a major problem in Ghana's urban areas. Besides making sure that the water can easily flow through the system, the cleaning can also reduce the amount of pollutants. At certain hotspots for gross litter

collection this should also be done manually to ensure the functioning of the network. To ensure that less trash gets into the storm water network in the first place, a more omnipresent trash collection in the form of public trashcans to provide an easily accessible alternative.

Another issue raised by the Australian Manual was education and participatory approaches. It is essential to educate the people and give them the necessary information and skills so that they can make better decisions in terms of storm water management. There could also be training for volunteers from residential areas to learn about best practice or the community could be engaged in a participatory approach to build up knowledge about a sustainable storm water approach.

9.4 Structural Solutions

For maximum benefits, a mix of non-structural and structural solutions should be used. These structural solutions store, infiltrate and/or use storm water runoff close to its source. In comparison to centrally located typical structural solution, SUDS structural solutions are usually spread over a development site like the non-structural measures. This is done to closely mimic the site's predeveloped hydrology. However, the configuration, operation, and maintenance of SUDS structural solutions is like those large scale, centralized structural measures, the SUDS solutions are smaller and closer to the runoff source. Therefore, they receive significantly less runoff than a single, centralized measure would.
Structural solutions can be grouped into storm water storage and use, infiltration systems, conveyance systems, detention systems and pollutant control. These will be discussed in more depth in the following.

Also, known as storm water harvesting, storm water retention and use can be part of the integrated water cycle management in any urban setting. It does not only have the potential to mitigate the effects of storm water runoff, but can put them to good use. To store the water rainwater tanks, below ground rainwater storage units or raingardens could be used. At a larger scale (not belonging to the SUDS solutions then anymore) managed aquifer recharge is another possibility to use the storm water.

The idea of infiltration systems is that most the storm water is infiltrated again into the ground and not led to a surface water body. This can very simply be achieved by the provision of a soil surface or vegetated area as these can effectively reduce the amount of storm water runoff, but also infiltration basins and trenches, soak wells and pervious pavements are forms of infiltration systems. The advantage of at-source infiltration used in SUDS solutions in comparison to standard end-of pipe systems is that the water has less chance to pick up any pollutions which could then enter the groundwater.

Natural conveyance systems can appear in the form of swales and buffer strips, bioretention systems as well as living streams. It is easier to apply them to new development sites, but they can also be retrofitted to existing development areas to replace existing steep sided drains or to rehabilitate degraded waterways. Besides their storm water control function, these conveyance systems can also provide aesthetic and recreational values in the urban environment.
The fourth group are detention systems, and these are designed for detaining storm water rather than infiltrating it. Types of detention systems are constructed wetlands, dry/ephemeral detention areas and on-site detention systems. The primary concern of these systems is flood protection of downstream environments but at the same time these systems can remove pollutants from the storm water through biological processes.

The last group concerns itself with pollutant control to ensure the quality of the water and not with the runoff volume itself. Pollutant control devices can be littler and sediment management systems and hydrocarbon management systems and are component of an overall storm water management treatment train. The primary goal is to remove gross pollutants from the waste.

9. Recommendations

The water sector in Ghana needs a clearly defined action plan to solve its challenges. In consultation with governments, donor agencies, implementers, and other key stakeholders, The Delegation of German Industry & Commerce in Ghana identified the challenges listed in the preceding section and mapped out recommendations to overcome those barriers to catalyze on shared growth with a sustainable infrastructure framework. This would require major policy reforms and operational and management strategies to overcome the hurdles that exist.

9.1 Actions to tackle challenges, and ensure finance is effectively turned into services:

- Ensure better linkage between sector targets and funding allocations.
- Increase domestic allocations and disbursements to sector institutions and ensure prompt utilization of funds.
- Provide greater visibility for sanitation by further defining and disaggregating sanitation budget lines.
- Urgently pursue the development of comprehensive sector investment plans.
- Empower District Assemblies to take full ownership of service delivery through capacity building and funding support.
- Ensure greater synergy between the CWSA and GWCL in implementation of projects to benefit from economies of scale and avoid under- or over-laps in service areas.
- Develop innovative approaches to financing, particularly for sanitation
- Undertake regular monitoring of the equity of access to services.
- MoSWR should collaborate with Ghana Statistics Service to conduct a water-, sanitation-, and hygiene-specific survey to provide needed data not captured under the national representative surveys.
- Agree to definitions and a set of national indicators for water supply and sanitation.
- Implement the District Monitoring and Evaluation System nationally.
- Undertake consolidated annual sector reporting.

9.2 Rural Water Supply

- Revisit implications on sustainability of removing the 5 percent community contribution to capital costs.
- Close the funding gap for rural water supply.

9.3 Urban Water Supply

- Bring tariffs in line with full-cost recovery, in parallel with successful achievement of efficiency targets.
- Ensure greater participation of existing consumers and potential consumers in investment and supply decisions of the GWCL.
- Mainstream independent value-for-money studies in all loans/grants for urban water supply projects.
- Institute a system of incentives and penalties for management of urban water supply.
- Give greater visibility to pro-poor unit within the urban utility.

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