REPUBLIC OF GHANA

MINISTRY OF WATER RESOURCES, WORKS AND HOUSING

Improvement of Water Sector Performance Management Framework
(IWSPMF)

NATIONAL RAINWATER HARVESTING STRATEGY

Final Report

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TABLE OF CONTENTS

Boxes

List of Tables

List of Figures

ABBREVIATIONS AND ACRONYMS

ADRA	Adventist Development and Relief Agency
AfDB	Africa Development Bank
CC	Climate Change
CSIR	Council for Scientific and Industrial Research
CSIR-WRI	CSIR-Water Research Institute
CWSA	Community Water and Sanitation Agency
DANIDA	Danish International Development Assistance
EDF	European Development Fund
EPA	Environmental Protection Agency
EU	European Union
GIS	Geographic Information System
GMet	Ghana Meteorological Agency
GNAT	Ghana National Association of Teachers
GNFS	Ghana National Fire Service
GoG	Government of Ghana
GSA	Ghana Science Association
GWCL	Ghana Water Company Limited
HES	Hydro-Environ Solutions Limited
HSD	Hydrological Services Department
IGF	Internally Generated Funds
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
IWSPMF	Improvement of Water Sector Performance Management Framework
JMP	Joint Monitoring Programme
LI	Legislative Instrument
MMDAs	Municipal, Metropolitan, and District Assemblies
MoU	Memorandum of Understanding
MWRWH	Ministry of Water Resources, Works and Housing
NAO	National Authorizing Officer
NRWHS	National Rainwater Harvesting Strategy
NWP	National Water Policy
NWV	National Water Vision
RWH	Rainwater Harvesting
RWHS	Rainwater Harvesting Strategy
SWAp	Sector Wide Approach
UNEP	United Nations Environment Programme
WASH	Water, Sanitation and Hygiene
WD	Water Directorate
WRC	Water Resources Commission
WSS	Water Supply and Sanitation
WSSDP	Water Sector Strategic Development Plan
WSSPS	Water Supply and Sanitation Programme Support

EXECUTIVE SUMMARY

This National Rainwater Harvesting Strategy (NRWHS) has been prepared by the Ministry of Water Resources, Works and Housing (MWRWH) to guide the water sector and water-related actors in the promotion of rainwater harvesting (RWH) as a supplement to water service delivery in both urban and rural areas. It has been prepared as a deliverable under the national Integrated Water Resources Management (IWRM) Strategic Plan, and hence articulates the priorities assigned in the NWP. It is intended to reinforce the domestic and industrial water supply mandate of the MWRWH and outlines the strategic objectives and prioritised actions that will enhance the promotion of RWH as option for water conservation, flood mitigation and water for food production.

The NRWHS provide a *road-map* for enhanced planning, development and management of harvested rainwater and is intended to serve as framework from which a series of action programmes toward the greater adoption of RWH in Ghana would be elaborated. It is based on Ghana's vision for water resources management and water service delivery, for the period 2012-2025.

The NRWHS focuses on key issues and challenges raised by stakeholders during consultations and workshops conducted as part of the strategy preparation process. The issues and challenges identified are distilled into key strategic objectives which form the basis of the rainwater harvesting strategy. Each objective is supported by a number of strategic actions as listed below.

Objective 1. To develop and implement effective regulatory and institutional frameworks for institutionalization of RWH

Strategy 1.1 Review existing regulatory/legal instruments and formulate appropriate legislation for RWH (including incentives regimes for sustainable financing);

Strategy 1.2: Establish relevant institutional arrangement for effective promotion and coordination of RWH interventions

Objective 2 Stimulate interest in and promote support for RWH through sustained awareness-creation campaigns

Strategy 2.1 Establish clear and sustained awareness-creation modules for the public and policy-makers

Strategy 2.2 Establish RWH demonstration schemes

Objective 3 Strengthen Human and Institutional capacities to carry out key RWH mandates

Strategy 3.1 Develop and improve national competency in developing (design and construction) and operating RWH systems

Strategy 3.2 Strengthen operational and administrative capacities to manage RWH at all levels

Objective 4 Improve knowledge base on technology options and water quality of RWH systems through research

Strategy 4.1 Promote scientific investigations/research on affordable technologies

Strategy4.2 Develop standards and guidelines for RWH technology

The NRWHS objectives are in coherence with the objectives of the National Integrated Water Resources Management (IWRM) Strategy, and by implication, the Water Sector Strategic Development Plan (WSSDP). A comprehensive implementation framework for the NRWHS is given in Table 3.1, and the details of each strategic action (including expected outputs and indicative budget) is elaborated as Action Sheets and presented in Annex 1.

The implementation of the NRWHS will be spearheaded by the Water Resources Commission (WRC), with the Water Directorate of the Ministry of Water Resources, Works and Housing (MWRWH) providing the policy backstopping.

As a cross-cutting strategy, its implementation will rely on existing structures and institutions as much as possible, involving multi-stakeholders from government, private and non-governmental organisations, the academia and community based organisations. Cooperation and delegation of responsibilities will take place rather than creation of very elaborate organisational units.

A programme Steering Committee consisting of various sector ministries and government agencies, NGOs and development partners (DPs) will be set up to monitor progress and coordinate the inputs of the multi-stakeholders.

To assist in monitoring, evaluation and reporting on progress in the implementation of the NRWHS, some operational and progress indicators have been included in the implementation plan (see Table 3.1), which would be used initially to monitoring progress. The programme management unit (PMU) when established will prepared a comprehensive monitoring and evaluation (M&E) plan as a deliverable of this strategy.
The major internal progress monitoring tools for this strategy will be the quarterly progress reports and annual reports to be compiled by the PMU and presented at the regular Steering Committee meetings.

1.0 INTRODUCTION

1.1 Background and context

This National Rainwater Harvesting Strategy (NRWHS) has been prepared by the Ministry of Water Resources, Works and Housing (MWRWH) to guide the water sector and water-related actors in the promotion of rainwater harvesting (RWH) as a supplement to water service delivery in both urban and rural areas.

The strategy is intended to provide a *road-map* for enhanced planning, development and management of rainwater harvesting and serve as a guide for elaboration of a series of action programmes toward the greater adoption of RWH in Ghana.

While RWH structures have been used for years in most countries in the semi arid areas of East Africa (e.g. Tanzania and Kenya) and in neighbouring Burkina Faso, the practice is generally less institutionally accepted in Ghana, even though it is known that during the colonial era many missionary and government residences had RWH incorporated in their design.

Box 1: RWH Policy statement from NWP, 2007.

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.

To harness this potential, government will enact 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.

The advocacy for institutionalization of RWH was intensified following the recommendations issued by the Ghana Science Association (GSA) at its 10th Biennial Workshop on the theme "Rainwater Harvesting: A sustainable solution to water shortage problems in Ghana" held at the GNAT Hall in July 2006 and the subsequent adoption of the National Water Policy (NWP) in 2007, which advocates for the implementation of rainwater harvesting[1] (see Box 1) and further reinforced through recommendations from the annual National Water Forums.

Before then, the importance of RWH as a supplement to water delivery was invisible in water planning frameworks, as Ghana relied almost exclusively on rivers and groundwater supplies. As a result, there has been little commitment to investment in RWH

With the increasing pressure on available water resources due to population growth, rapid urbanization and climate change impacts, rainwater harvesting appears to be one of the most promising alternatives for supplying freshwater.

In the majority of urban areas, water is rationed due to high demand and inadequate supply. In Accra, for example, it has been estimated that only approximately 25% of residents enjoy a 24-hour water supply. About 30% have an average of 12 hours service every day for five days a week. Another 35% have service for two days each week while the remaining

[1] NWP (2007), pp 5, and section 2.2.6.

residents on the outskirts of Accra are completely without access to piped water supplies[2]. This pattern is more acute in other urban centres (Kumasi, Tamale, Bolgatanga, etc.). Ghana Water Company Limited (GWCL) estimates that while demand stood at 1,076,527m^3 of water per day as at 2010, only about 244.6m^3 was produced per day. The un-served areas depend on secondary supplies (i.e. vendors and mostly tanker service delivery or dedicated GWCL filling points).

With appropriate technology and incentives, rainwater harvesting could provide a reasonable amount of water for household and other institutional water needs (including fire-fighting) thereby reducing demand on the central supply systems and therefore making more freshwater resources available for use. Again, saving water by harvesting rain will reduce the amount of chemicals and energy that the GWCL uses to treat water and to pump it to reach users.

This NRWHS has been prepared as a deliverable under the national Integrated Water Resources Management (IWRM) Strategic Plan, and hence articulates the priorities assigned in the NWP. It is intended to reinforce the domestic and industrial water supply mandate of the MWRWH[3], and outlines the strategic objectives and prioritised actions that enhance the promotion of RWH as option for water conservation as well as for flood mitigation.

1.2 General context of the rainwater harvesting strategy

Rainwater harvesting broadly refers to the practice of capturing and storing rainwater where it falls for consumptive and non-consumptive uses. It is an ancient technique that has been successfully utilized by people all over the world for many centuries, and remains an important source, if not the only source of fresh water for many communities, particularly those isolated from urban water distribution systems.

Rain may be harvested from roofs and ground surfaces as well as from intermittent or ephemeral watercourses. Water harvesting techniques, which collects runoff from roofs or ground surfaces fall under the term 'Rainwater Harvesting' while all systems which collect discharges from watercourses are grouped under the term 'Floodwater Harvesting'[4]. RWH systems consist of at least the following components:

1. Rainfall
2. A collection system (catchment area or roof surface) to collect rainwater.
3. Conveyance system (gutters) to transport the water from the roof or a catchment to the storage reservoir.
4. Storage reservoirs or tanks to store the water until it is used.
5. An extraction device; depending on the location of the storage tank, may be a tap, rope and bucket, or a pump or an infiltration device in the event that the collected water is used for well or groundwater recharge

[2] Water Supply and Sanitation Sector Assessment, 2000

[3] Ministry of Food and Agriculture (MOFA), through various irrigation schemes is implementing water harvesting for agriculture production.

[4] AfDB (2007). Rainwater harvesting handbook.

Other devices may include the following:

- An overflow pipe leading into either infiltration plants, drainage pipes with sufficient capacity or the municipal sewage pipe system
- An indicator of the amount of water in the storage tank
- A vent for air circulation (often the overflow pipe can substitute)
- Protection against insects, rodents, vermin, etc. may also be required

Collection systems can vary from simple types within a household to bigger systems where a large catchment area contributes to an impounding reservoir from which water is either gravitated or pumped to water treatment plants. Some of the systems are described below.

(i) Roof water RWH systems

While the collection of rainwater by a single household may not be significant, the impact of thousands or even millions of household rainwater storage tanks can potentially be enormous. The main components in a simple roof water collection system are the cistern (storage system), the piping (conveyance system) that leads to the cistern and the accessories within the cistern.

The materials and the degree of sophistication of the whole system largely depend on the initial capital investment. Some cost effective systems involve cisterns made with ferro-cement, etc. In some cases, the harvested rainwater may be filtered. In other cases, the rainwater may be disinfected.

(ii) Institutional RWH system (educational institutions, hotels, stadiums, etc.)

When the systems are larger, the overall system can become a bit more complicated, for example rainwater collection from the roofs and grounds of institutions, storage in underground reservoirs, treatment and then use for non-potable applications (fire-fighting, toilet flushing, etc.).

(iii) Land surface catchments

RWH using ground or land surface catchment areas can be a simple way of collecting rainwater. Compared to rooftop catchment techniques, ground catchment techniques provide more opportunity for collecting water from a larger surface area. By retaining the flows (including flood flows) of small creeks and streams in small storage reservoirs (on surface or underground) created by low cost dams (e.g. earthen dams), this technology can meet water demands during dry periods. There is a possibility of high rates of water loss due to infiltration into the ground and evaporation. Because of the often marginal quality of the water collected, this technique is mainly suitable for storing water for agricultural purposes.

Benefits of RWH

RWH enables people at household and community levels to be empowered to access alternate water sources and to manage their own water, thereby reducing their reliance and burden on central supply systems. Besides access to safe water, **RWH** yields numerous benefits: environmental (no negative impact), social (empowers people), economic (relatively low cost), as well as contributing to sustainable development (poverty reduction)**.**

Other benefits of RWH include the following:

- Saves valuable drinking water, which will reduce water bills of individuals and organisations.
- Provides an alternative water supply for day-to-day household activities (e.g. toilet flushing) independent of the treated water supply
- Reduces the volume of storm water leaving homes and properties, thus minimize flooding
- Saves women and children from the tedious work of walking long distances to fetch water;
- Could contribute significantly to addressing poverty and related challenges that most under-privileged communities face by making water available for household gardening.

1.3 Purpose and scope of the NRWHS

This National Rainwater Harvesting Strategy has been prepared by the Ministry of Water Resources, Works and Housing in collaboration with all concerned stakeholders in the water sector to articulate the priorities assigned by the Government of Ghana in the implementation of its NWP in the medium to long term. The NRWHS is based on a vision for water resources management and water service delivery by the year 2025, and contains a set of objectives and priority activities for the period 2012-2025. It is intended to provide a *road-map* for enhanced planning, development and management of domestic rainwater harvesting in the country and serve as a guide for elaboration of a series of action programmes toward the greater adoption of RWH.

The Strategy focuses on key issues and challenges raised by stakeholders during the consultations and a workshop, among which are the following:

- Rainwater harvesting systems are often not part of the building code and lack clear guidelines for users/developers to follow;
- A general lack of awareness is a barrier to RWH implementation.
- RWH systems remain restricted in use by the apparently high initial cost of constructing of storage facility.
- Frequent shortages and rationing of water in most urban towns and cities due to inadequate supply resulting in women and children spending inordinate amounts of unproductive time searching for water for homes;
- Lack of promotion of water conservation and rainwater harvesting is due to the need by GWCL to recover infrastructure development costs through sales of piped water. Extensive development of rainwater harvesting systems may therefore reduce the income of GWCL
- Rainwater storage tanks may take up valuable building space;
- Development costs of larger (or institutional) rainwater catchment system may be too high

In the context of the NWP, the RWHS is being developed to contribute significantly to addressing poverty and related challenges that most under-privileged and peri-urban communities face. The focus of this RWHS will therefore not be based on the traditional one-dimensional approach that focuses solely on the provision of adequate quantities of potable water but will rather be based on a more holistic approach that looks at water as a precious resource which needs to be leveraged for more than drinking water purposes alone. In order for any RWH programme to be sustainable, the prime focus will be to educate and support all

stakeholders and create an increased awareness of the need to harmonize the use and conservation of water resources (in a sustainable fashion) that will ensure its security for future generations.

These and other issues are distilled into key strategic objectives which form the basis of the rainwater harvesting strategy, including the following;

i. To develop and implement effective regulatory and institutional frameworks for institutionalization of RWH;

ii To stimulate interest in and promote support for RWH through sustained awareness-creation campaigns;

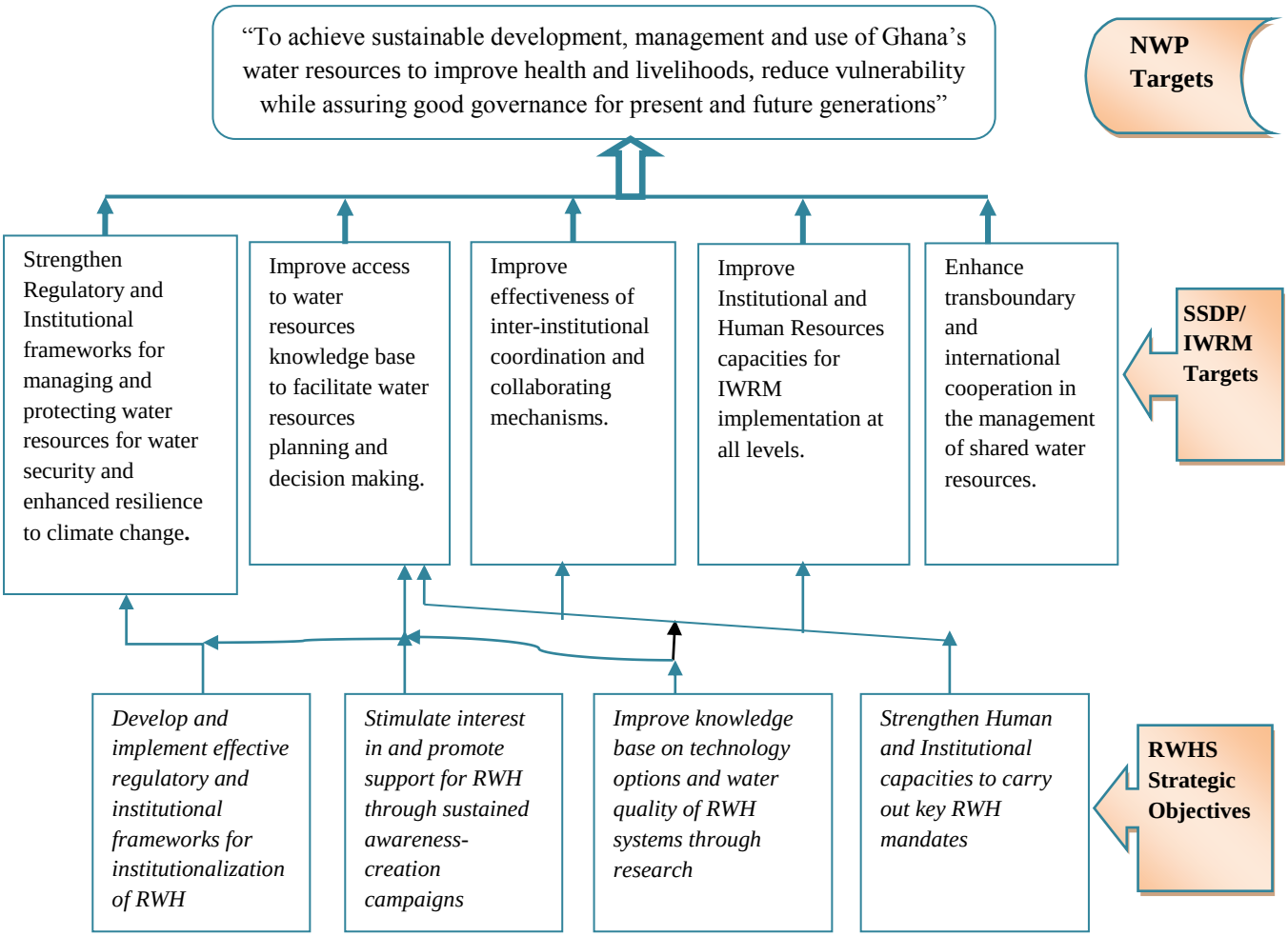
iii. To strengthen Human and Institutional capacities to carry out key RWH mandates;

iv. To improve knowledge base on technology options and water quality of RWH systems through research.

Each objective area is supported by a number of strategic actions to be in coherence with the objectives of the National Integrated Water Resources Management (IWRM) Strategy, hence the Water Sector Strategic Development Plan (WSSDP) and the National Water Policy (see Figure 1.1).

The report is divided into 4 Chapters with a separate Executive Summary. The Executive Summary summarizes key strategic objectives of the NRWHS and the prioritised actions programmes that will facilitate the institutionalization of RWH.
Chapter 1 provides an introduction and highlights the general framework within which the strategy was developed. This chapter also outlines the specific scope of the NRWHS. A situation analysis of water supply and RWH issues is presented in ***Chapter 2***. ***In Chapter 3***, broad objectives of the NRWHS are set and corresponding management actions that will be taken to achieve the objectives are spelt out. ***Chapter 4*** provides the institutional arrangements and modalities for implementation of the NRWHS.

Figure 1. 1: Rainwater harvesting strategy and IWRM Strategy linkages



2.0 WATER SITUATION ANALYSIS

2.1 Country location, physical, demographic and socio-economic features

Ghana lies along the Gulf of Guinea in West Africa, within longitudes $3^0 5'$W and $1^0 10'$E and latitudes $4^0 35'$N and 11^0N. It covers an area of about 238,540 km^2 and shares borders with Côte d'Ivoire to the west, Burkina Faso to the north, Togo to the east, and to the south is the Atlantic Ocean (Figure 2.1).

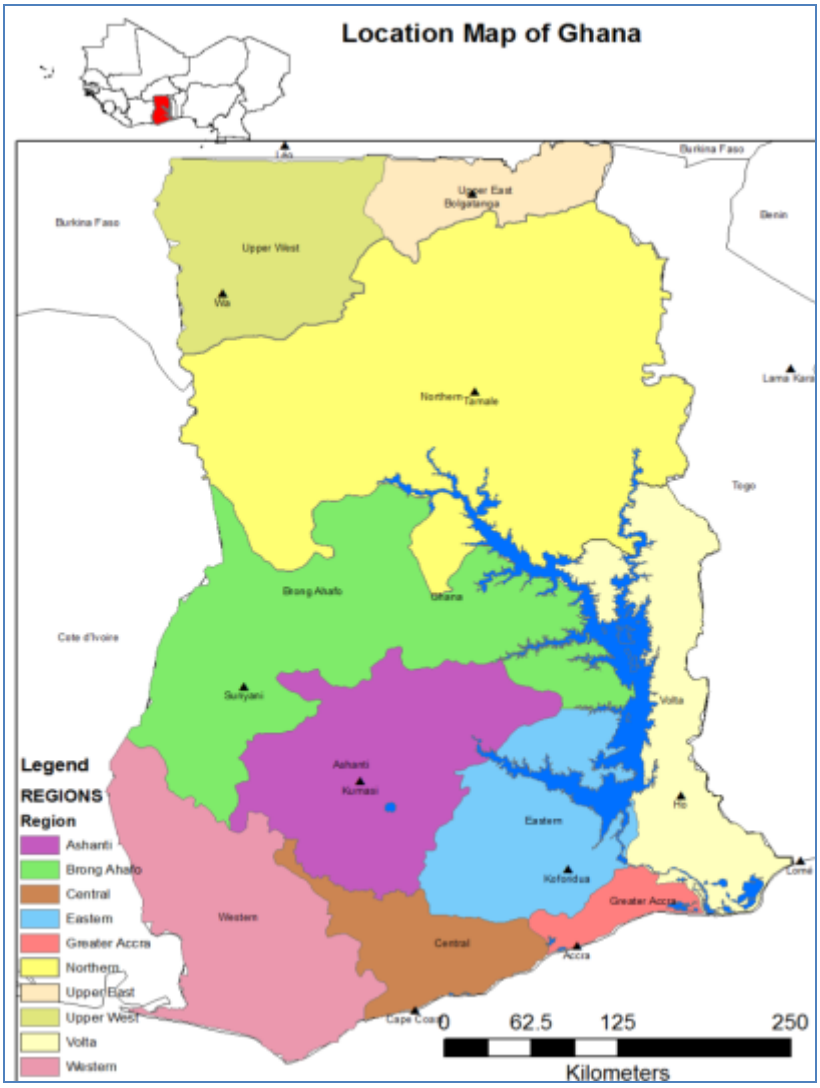


Figure 2. 1: Location and Administrative Regions of Ghana

Box 3: Ghana: Summary of basic facts

Country area: 238,540 km^2

Population (2009)*: 23,837,261

GDP per capita (2009)*: US$1,098

*Source: http://data.worldbank.org/country/ghana

The country has an estimated population of about 23.8 million[5] (Box 2), which is predominantly rural. The urban population is skewed towards the south with Accra the capital city having 17% of the total. With a growth rate of 2.7%, the population of Ghana is projected to double after 26 years. This high population growth imposes increased demand on water and other natural resources exploitation, including agricultural land, fuel-wood and land for development to an extent that threatens fragile ecosystems. The rural population is primarily dependant on agriculture which contributed to nearly 40% of the GDP in 2009 and providing for over 52% of the active population of Ghana[6].

There are six agro-ecological zones (AEZ) defined on the basis of climate and reflected by the natural vegetation (Figure 2.2). About two-thirds of the country is covered by savannah vegetation, of which two major types are predominant—the Guinea or tall-grass savannah and the Sudan or short-grass savannah. Along the eastern coast, a coastal savannah vegetation formation dominates and is usually referred to as the Accra-Winneba Plains.

The average rainfall is about 1,200mm/year, varying from 800mm/yr in the coastal savannah zone to 2,200 in the south-western tropical rainforest. Rainfall distribution is bimodal in the tropical forest, semi-deciduous forest and transition zones, giving rise to a major and a minor growing season. In the remaining two ecological zones (guinea savannah and sudan savannah), the unimodal rainfall distribution gives rise to only one growing season. The seasonal variations of rainfall in various AEZs are given in Annex 2.

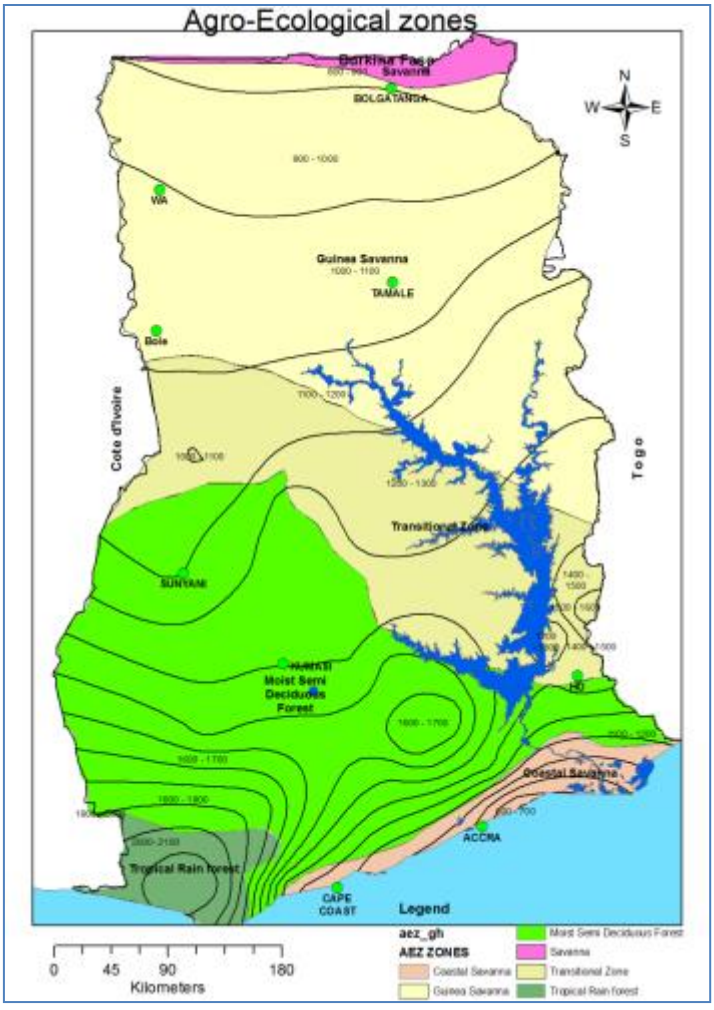


Figure 2. 2: Agro-Ecological zones of Ghana and rainfall distribution

[5] GSS (2009).

[6] *Country Environmental Profile of Ghana, Final Report, October 2006*

2.2 The enabling environment for the implementation of NRWHS.

2.2.1 Legal and Regulatory Framework

Within the overall framework of the 1992 Constitution, the policy framework for water resources management and development in Ghana is anchored on two very important documents: i.e. the WRC Act 522 of 1996 and the National Water Policy (NWP) of 2007. These documents promote an integrated approach to the management of the water resources in ways that are sustainable and most beneficial to the country, and are based on the continuing recognition of the social value of water, while at the same time giving much more attention to its economic value.

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'.

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.

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 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.

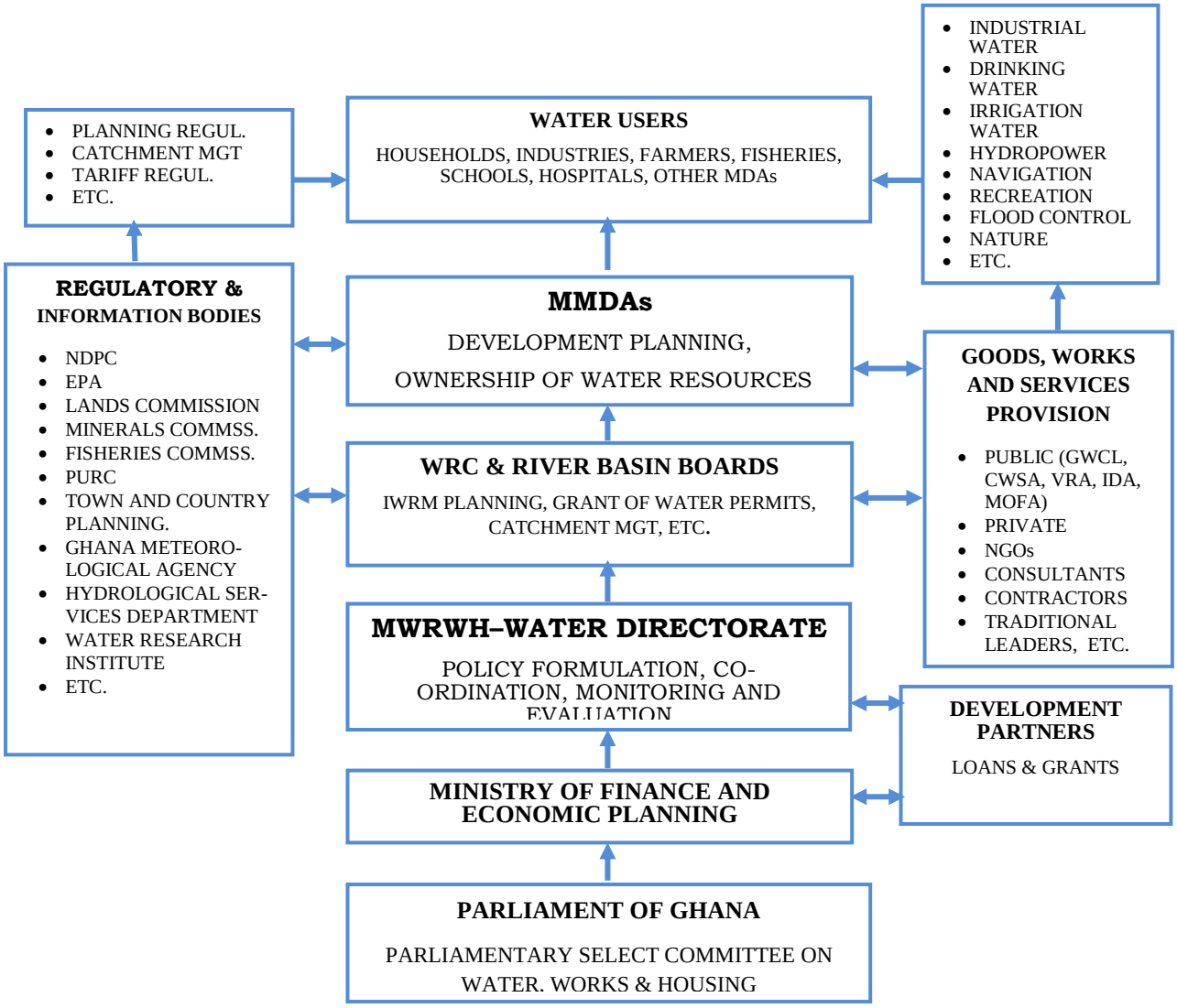
Ghana also belongs to regional and sub-regional organizations such as: the West African Water Partnership of the Global Water Partnership (GWP/WAWP); the African Ministers'

Council on Water (AMCOW); the Permanent Framework for Coordination and Monitoring (PFCM) of IWRM under ECOWAS; and the six-nation Volta Basin Authority (VBA).

2.2.2 Institutional framework for IWRM

The NWP outlines the overall policy framework for the water sector and it covers the key areas of water resources management, urban water supply, and rural water supply and sanitation. Specific to the water resources management, various institutions and stakeholders operate at different functional levels, namely Policy/Strategic, Organisational and Operational levels as illustrated in Figure 2.3.

Figure 2. 3: Institutional roles and linkages for IWRM



Source: WRC (2003). Densu Basin IWRM Plan

At the Policy/Strategic level, Ministry of Water Resources, Works and Housing, Ministry of Finance and Economic Planning, and Development Partners (DPs) collaborate to ensure the delivery of water services. MWRWH is responsible for overall sector policy guidance, and provides national level management and policy direction functions in the water resources sector. Until recently, the sector was hampered by the absence of clear overarching strategy and a sector-wide coordination framework. To provide policy direction at the national level

therefore, a ***Water Directorate (WD)*** was established in 2004 to give the water sector a voice, which had previously been lacking at central government level. The WD facilitated the finalisation of the NWP in 2007 and it is presently facilitating the development of a sector-wide funding arrangement (SWAp)[7] for the water sector. The WD is as well facilitating the linkages with the other sub-sectors and key Ministries, Departments and Agencies (MDAs) such as the Ministry of Local Government and Rural Development (MLGRD). The WD also has a key role to play in soliciting and coordinating funding from government and DPs, with the medium to long term perspective of developing consolidated SWAp.

The Ministry of Finance and Economic Planning (MoFEP) is responsible for the economic and monetary policy of Ghana. It is involved with economic planning, national budget, fiscal policy, and creating the environment for investment and growth. MoFEP will be encouraged to take active interest in the establishment of a viable RWH mechanism.

At the Organisational level, three distinct organisations perform different functions under the MWRWH, namely: - GWCL (for Urban Water Supply), CWSA (for Rural Water Supply and related sanitation provision) and the WRC (for Water Resources Management).

GWCL is a quasi-governmental company responsible for production and distribution of potable water to the urban population in Ghana. The company's core business includes investment planning, sector financial management, quality control over urban water sector operations, monitoring the private operator, consumer information and sensitization and community outreach activities.

The CWSA is a governmental institution responsible for planning, coordination, regulation, supervision, quality control, training and capacity-building for rural water and sanitation delivery through the implementation of the National Community Water and Sanitation Programme (NCWSP).

The WRC acts as the body responsible for all water resource-related development and management matters in the country. It is an inter-agency Commission that regulates water use through water allocation, and resolves issues and conflicts in water resources management and development. Membership of the WRC is drawn from the following:- Ghana Water Company Limited, Hydrological Services Department, Volta River Authority, Water Research Institute, Ghana Meteorological Agency, Environmental Protection Agency, Forestry Commission, and Minerals Commission. Also represented are Women, NGOs and Traditional Authorities (Chiefs).

The WRC performs its duties through its River Basin Boards to ensure coordination and stakeholders' participation in water resources management at the decentralised local government level.

At the Operational (or decentralised administrative) level, the River Basin Boards (RBBs), MMDAs, , NGOs/CBOs and other civil society groupings, working together within a river basin focused framework, are engaged to take charge and coordinate water resource

[7] SWAp is a mechanism whereby Government and development partners support a single policy and expenditure programme using a common approach

management and sanitation activities as far as feasible following the principle of "management at lowest appropriate level. Specific to RWH, the MMDAs provide the needed management support to the local communities in managing the infrastructure for domestic water supply and for irrigation systems.

NGOs in the water and sanitation sub-sector operate under an umbrella organisation – Coalition of NGOs in Water and Sanitation (CONIWAS) – with the view to improve coordination and networking among NGOs and CBOs engaged in the water sector. The main mission of CONIWAS 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. It also acts as link between its members and the government departments involved in the provision of water and sanitation services.

Several other governmental and non-governmental organizations are also involved in implementing water-related activities. Details of their roles can be found in the WASH Directory[8] for 2010.

2.3 Water Resources Potential

Ghana is well endowed with water resources, but the amount of water available changes markedly from season to season as well as from year to year. Also the distribution within the country is not uniform, with the south-western part (rain forest zone) being better watered than the coastal and northern regions (savannah zones).

Mean annual rainfall of the country is estimated at 1,187 mm. Annual potential open water evaporation has been estimated as ranging between 1,350 mm in the south to about 2,000 mm in the north. The total actual renewable water resources are estimated to be 53.2 km^3/yr, of which 30.3 km^3/yr are generated internally (Table 2.1).

Table 2. 1: Surface Water Resources Availability

Renewable water resources[#]		
Average precipitation	283.1	10^9m^3/yr
Internal renewable water resources	30.3	10^9m^3/yr
Contributions from outside the country	22.9	10^9m^3/yr
Total actual renewable water resources	***53.2***	***10^9m^3/yr***

[#]Source: FAO Aquastat Survey revised by Jean Margat in 2001.

The mean monthly rainfall in the AEZs

[8] http://www.wsmp.org/dir/results.php

2.4 Water Use

Consumptive Uses

The main consumptive uses of water in Ghana are water supply, irrigation and livestock watering. On the basis of surface water resources alone, the consumptive water demand for 2020 has been projected to be 5 billion m^3, which is equivalent to only some 12% of the total surface water resources. Notwithstanding the availability of water to meet water supply, there are deficits in coverage. While urban water supply coverage is estimated at 55% (2004), the rural and small town coverage is 51.6% (2004). With respect to irrigation, the projected demand by 2020 is about 400,000m^3, to cover a projected area of 100,000 hectares.

Non-Consumptive Uses

The main non-consumptive uses are inland fisheries, water transport and hydropower generation. Impoundments and reservoirs have been constructed for hydropower generation, potable water supply and irrigation. The first hydroelectric dam, constructed in 1965, is located 100 km from the source of the Volta River. The dam created one of the largest man-made lakes in the world, covering an area of about 8,500 km^2 at the Full Supply Level of 88.5 metres. A smaller, shallower impoundment, the Kpong Head-pond, covering an area of about 40 km^2, was created in 1981 when another hydroelectric dam was completed at Kpong, 20 km downstream of Akosombo. Other important impoundments are the Weija and Owabi Reservoirs on the Densu and Offin Rivers, respectively. The projected demand for hydropower generation by 2020 is 378,430 m^3 as against a projected supply of 1,733,380 m^3

Water Service Delivery

Available data indicates that the proportion of the Ghanaian population that uses improved drinking water has increased significantly from 54% in 1990 to 82% in 2008. Similarly the proportion of the urban population with access to improved drinking water has increased from 84% in 1990 to 90% in 2008, while that for rural population increased from 37% in 1990 to 74% in 2008 (Table 2.2).
If progress made between 1990 and 2008 is maintained, the projected coverage for improved water by 2015 will be 91.5%. Based on the JMP's definition and estimates, Ghana has currently exceeded the MDG 2015 target of 78% coverage for use of improved drinking water.

Table 2. 2:Water service coverage (1990-2008)

Year	% Water Coverage		
	Urban	Rural	National
1990	84	37	54
2000	88	58	71
2008	90	74	82
Source: WHO/UNICEF-JMP; Progress on Drinking Water and Sanitation, 2010 update			

However a significant proportion of the population still do not use improved sources of drinking water and more effort is still needed to extend coverage to these people

The national water supply coverage[9] is estimated at 59% by 2009. The implication is that about 41% of the population is yet to be served with water service based on standards set by the service providers (CWSA and GWCL.). On account of the current national water coverage rate, about 38.26%[10] of the existing population were yet to be served with potable water as at the end of 2010 especially in rural areas, low income urban communities and peri urban areas. A study by PURC concluded that the majority of the poor are un-served directly by GWCL except through informal services or secondary and tertiary sources[11]. With an anticipated increase in population especially in urban areas, additional investments should be provided to meet future increase in demand for water services.

[9] The national water coverage rate is based on "provider based" data from GWCL and CWSA.

[10] Estimate based on national water coverage rate published in the 2009 Water Sector Performance Report by MWRWH.

11 Public Utilities Regulatory Commission (2005). Urban Water Tariff Policy, February 2005.

3.0 FRAMEWORK FOR THE NATIONAL RAINWATER HARVESTING STRATEGY

3.1 Goals and Objectives of the NRWHS

Success in sustained implementation of a national RWH strategy is contingent on existence of an IWRM Plan. Fortunately, a national IWRM plan has been prepared and is being implemented by WRC. The WSSDP has been formulated to consolidate strategies in all the three sub-sectors (i.e. Urban Water Supply, Rural Water Supply and related Sanitation provision, and Water Resources Management). The NRWHS is based on a vision for water resources management and water service delivery as espoused in the WSSDP, and contains a set of objectives and priority activities covering the medium to long-term period 2012-2025.

The overall goal of the NRWHS covering the medium to long-term horizon is "to promote and strengthen RWH for water conservation and as augmentation measure for conventional potable networks in peri-urban and rural communities"

The strategic objectives to achieve this goal include the following

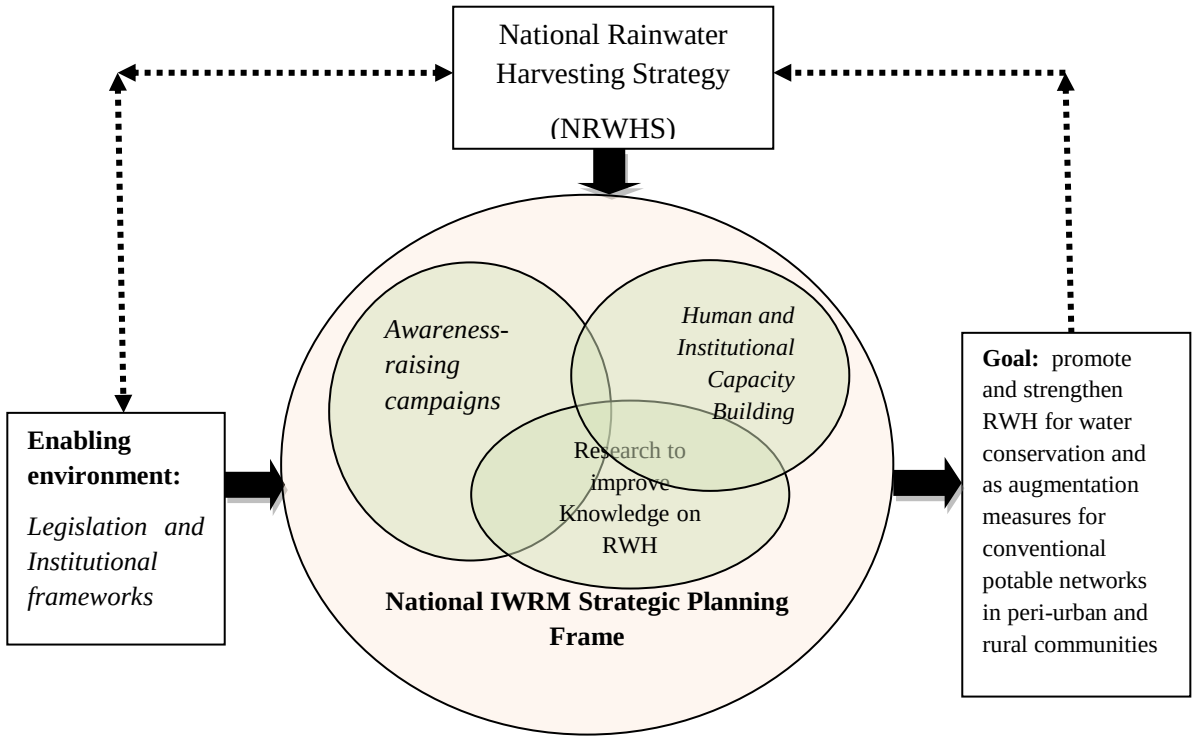
Objective 1 To develop and implement effective regulatory and institutional frameworks for institutionalization of RWH;

Objective 2 To stimulate interest in and promote support for RWH through sustained awareness-creation campaigns;

Objective 3 To strengthen Human and Institutional capacities to carry out key RWH mandates;

Objective 4 To improve knowledge base on technology options and water quality of RWH systems through research.

Figure 3. 1: NRWHS and IWRM Planning linkage



Each of the strategic objectives is supported by actions that the WRC (RWH Unit) will lead in the implementation in collaboration with partners, and are consistent with key principles of the NWP. The detailed actions with indicative cost are presented as work sheets in Annex 1.

Objective 1: Develop and implement effective regulatory and institutional frameworks for institutionalization of RWH

In order to ensure development, implementation and sustenance of RWH, the proper enabling environment will need to be guaranteed. The rationale for this is the fact that RWH in Ghana is not institutionalised and officially is not known or recognised. Any RWH systems in place have arisen more as an attempt to obtain sufficient and clean water for residents and establishments. Sufficient stimulation will be needed to empower the populace to adopt RWH and to overcome initial barriers and inertia to its widespread adoption. This environment will require good policy, institutional set up and adequate financing. For the beginning, all new government properties should be designed to harvest rainwater and existing government buildings should be re-designed to include rainwater harvesting.

1.1 Review existing regulatory/legal instruments and formulate appropriate legislation (including incentives regimes for sustainable financing) for RWH

The current national water policy as well as the Act that establishes the WRC and indeed all water related regulations do not adequately address or factor in the contribution of RWH across all water uses. Rainwater harvesting systems are often not part of the building code and lack clear guidelines for users/developers to follow. There are also no specific provisions in the national investment policy for the granting of incentives or concessions to commercial entities like hotels, hospitals, manufacturing and processing sectors to promote investments in RWH.

The first step to developing a strategy for the development of RWH will be to develop appropriate policy and regulatory framework for its development. In order to achieve this, adequate and motivating policy/regulatory framework need to be put in place to guide development of RWH. Priority areas for development including areas with difficult access to water, chronically poor areas who cannot afford the development of the technology in their communities will require support to enable them have access and NGO's and other organisations motivated to bring this technology to the communities should be supported to deliver these services. Regulations governing practice and delivery of RWH systems, manufacturing, maintenance and monitoring should be considered.

A legal framework will therefore be crafted to incorporate measures that encourages observance of best practices in water conservation technologies (including RWH), and a harmonized incentive regimes that fosters investments in RWH. Support could be provided to homeowners, private investors and the public institutions (national fire service, schools, hospitals) to foster implementation of RWH.
Key deliverables from this action include the following;

- Legislative and policy review reports;

- New legislation on rainwater harvesting incorporating incentive regimes for water conservation;
- Consultation workshops for the development of the NRWHS;

1.2 Establish relevant institutional arrangement for effective promotion of RWH

The institutional establishment, hierarchy and roles will be clearly defined to ensure effective delivery of the technology across all the facets of its implementation. RWH serves various functions including, domestic and industrial water uses, agriculture, livestock and aquaculture water uses, flood protection, ecosystem protection and sustenance of the bio-environment system, recharge of aquifer systems and also for recreational uses. The institutional set up should be defined to take care of all or most of these needs as part of the requirements of the Integrated Water Resources Management (IWRM) principles. The institution(s) mandated to oversee RWH either on specific water uses or across all water uses will be required to ensure that RWH satisfy all water needs and not only human needs so that the environment is not further disadvantaged and therefore pose further difficulties on man.

It is recommended that the overarching responsibility for RWH rest with the MWRWH. It is also recommended that a programme management unit be created in the WRC to be in charge of RWH and to collaborate with all stakeholders. For the purpose of implementation, the GUWL and CWSA should be responsible for urban and rural water supply respectively. MoFA/GIDA should be responsible for developing irrigation reservoirs that harvest rainwater for agriculture. The Ghana Highway Authority (GHA) should be responsible for incorporating necessary designs that will include catchment facilities that utilise existing road networks for harvesting rainwater into dugouts and dams for irrigation as well as for ecosystem protection and groundwater recharge systems. The Hydrological Services Department (HSD) will be responsible for developing detention reservoirs for flood control and disaster management. The Forestry Commission (FC), Ghana Tourist Authority (GTA) would be responsible for proposing systems that will enhance ecosystem protection benefits of RWH including appropriate sites for watering holes for wildlife and storage reservoirs that double as recreational facilities for swimming, boat riding and other water sport. It is important to realise the multi-use features of RWH and to not concentrate all the functions under one organisation. Certainly, agriculture, water supply, ecosystem protection, groundwater recharge and flood/disaster management must be handled by different organisations under the RWHS.

Objective 2: Stimulate interest in and promote support for RWH through sustained awareness-creation campaigns

RWH in the country was at one time universally practised before the introduction of the first piped water supply network in 1928 at Cape Coast. Traditional RWH systems then were rudimentary but as communities became more affluent and houses were built with internal plumbing, the perceived need for RWH declined and generally fell out of favour.

Due to increasing pressure on available water resources as a result of population growth and rapid urbanization, water delivery in most urban systems have become erratic and unreliable. Most workers scramble for water for long hours before going to work, resulting in the loss of significant and productive man-hours. Schoolchildren also waste precious study hours looking for water. Ministries, Departments and Agencies (MDAs) as well as health and educational institutions often face serious sanitation problems because of lack of water while residents of newly developed estates and areas also cry for water. Consequently, renewed interest in RWH has emerged in Ghana.

Actions under this objective therefore focus on crafting a new image for RWH on the premise of building resilience in an environment where there is increasing pressure on scarce water resources.

2.1 *Establish clear and sustained awareness creation modules for beneficiaries and public*

Awareness-creation will be instituted by WRC with assistance of partner organisations and the media. Educational institutions will be targeted as partners for key information dissemination and as agents for curricula development and training.

Some key tasks include the following;

- Organisation of workshops and seminars for public and policy-makers (at least 4 per year)
- Undertaking Media productions (video documentaries and brochures)
- Disseminate technical material
- Mount exhibitions at the National Water Forums and other water-related conferences
- Organise schools competitions on radio and television
- Create a RWH website

2.2 Establish pilot RWH schemes

To assist awareness-creation for demonstration and research studies, pilots of the different technology options together with associated costs of construction should be spearheaded by the GoG/MWRWH. Focus should be on testing technology types, models for both the rural and urban situations. GoG must initiate financial assistance scheme to support recognised government/private schools, hospitals, charitable institutions and NGOs to pilot RWH schemes. For starters, TOR for Consultants to produce manuals for at least two the pilot projects; one for rural and one for urban households should be produced by mid-2012. MOFA should also establish pilots for the agricultural use of RWH. MWRWH/MoFEP should establish a funding mechanism for the pilot projects. Lessons

Objective 3 Strengthen Human and Institutional capacities to carry out key RWH mandates.

Different actors and stakeholders provide different and varied services in RWH sub-sector because of the various needs that rainwater harvesting satisfies. The different actors and stakeholders will thus require clear roles that do not conflict nor cut across other actors' responsibilities.

Also, knowledge on design standards and maintenance of RWH schemes is generally lacking among practitioners, especially building contractors and estate developers. Capacity will need to be developed in application of RWH technologies for non-household uses, particularly in the commercial and agricultural sectors, with a clear focus on enhancing efficiencies in water utilization. RWH application can also be extended to municipal use in the case of fire-fighting where paved roads, parking lot surfaces, and roofs of large buildings can be used to harvest rainwater for storage at strategic locations as water reserves.

Capacity building of stakeholders should be taken up by MWRWH in collaboration with technical/training institutions to implement relevant training and support for stakeholder categories.

3.1 Develop and improve national competency in developing (design and construction) and operating RWH systems

Based on the institutional arrangements proposed in section 1.2, multiple skills are required to effectively ensure the effective exploitation of the RWH technologies. The RWH programme will train a cadre of specialists (Engineers, Architects, Environmentalists, and Artisans) in the area of planning, design, implementation and monitoring of RWH schemes. Training will also be necessary for public service professionals in the Water Directorate of the Ministry of Water Resources, Works and Housing, and the Planning Division of Ministry of Food and Agriculture to equip them with the necessary advisory and technical support tools for transfer to clients.

It is anticipated that the Ghana Institution of Engineers (GhIE) will assist in fashioning out these training need and support coordinated capacity development. New curricular development in technical and tertiary institutions (KNUST and the Polytechnics) will be required to provide sufficient capacity in RWH.

3.2 Strengthen the operational and administrative capacities to manage RWH at all levels

Different actors and stakeholders provide different and varied services in the RWH sector because of the various needs that rainwater harvesting satisfies. The different actors and stakeholders will thus require clear roles that do not conflict nor cut across other actors' responsibilities. Roles for drinking water should be different for urban and rural communities. Roles for agriculture, ecosystem protection, flood protection and groundwater recharge should also be different and clearly stated. Since these roles cut across the different ministries, clear mandates that meet the objectives of IWRM should be formulated that will enhance and optimise the use of rainwater.

It is proposed that programme administration capacity be built to ensure coordination of the various RWH programmes. Arrangement will be made for other institutions (MWRWH, MLGRD, MoFA, MFEP, Private Sector, NGO's, CWSA, GUWL) to provide technical backstopping and on-the-job training to the RWH administrative unit.

At the community level, RWH schemes are being implemented by the CWSA as one of the technology options for water delivery to small communities under the Community Water and Sanitation Programme (CWSP)[12]. There is the need to build capacity of the local people to operate and manage the schemes efficiently.

Objective 4 Improve knowledge base on technology options and water quality of RWH systems through research.

RWH practice in Ghana is poorly documented. There is the need for research to identify areas for improvement and redress. Innovations in alternative materials, water treatment options and cheaper options will be required as the technology develops.

A considerable number of research and sharing platforms have been established in water resources at the national level. These research outputs have sought to address sector issues on science and technology. What is lacking is research on many emerging issues such as rainwater harvesting, water sector institutional development, and strategy development. Based on the existing experiences, financial support will be provided to support further research on these and other emerging issues.

4.1 Promote scientific investigations/research on affordable technology

The provision of storage tank is the most costly element of a RWH scheme, usually about 90% of the total cost. Research will focus on safe and low-cost alternatives for rainwater storage, especially the use of local materials for construction. Other potential areas of investigation will include: Cataloguing existing RWH facilities and their performances with time; monitor the quality of rainwater harvested to inform appropriate treatment options for various water needs; Affordability for the poor especially the women; investigate the health impacts of drinking harvested rainwater,.

4.2 Develop standards and guidelines for RWH technology options

A number of Studies carried out by the International Water Management Institute (IWMI) identified a variety of RWH technologies (over sixty) that are in use in East and West Africa. To facilitate the implementation of RWH some guidelines are expected to be developed as outputs from research (section 4.1). Standards for storage reservoirs (reinforced concrete tanks either above or below ground, ferro-cement tanks, polytanks and other storage systems should be clearly specified indicating what is permissible and what is unacceptable. In order that the poor are not marginalised in accessing this technology, low cost systems should be included in the formulation of the designs. A range of suitable designs should be established

[12] *Siabi W.K. et al (2006), Rainwater Harvesting, Last Water Supply options for Small Communities and Institutions in difficult Hydro-geological formations*

to ensure universal access. Standard designs for communal water supply, domestic water supply and industrial water supply systems should be produced to aid contractors to produce systems that meet these standards and to ensure that no arbitrary systems are unleashed onto the market. Standardisation will also be required in the provision of RWH systems for agricultural production especially by ensuring that road networks make provision for channelling harvested rainwater into irrigation ponds and reservoirs, and also for flood detentions reservoirs located outside urban areas for preventing peak floods from flooding urban cities.

An overview of the RWHS framework is given in Table 3.1, and the details of each strategic action (including expected outputs and indicative budget) is prepared and presented as Action Sheets in Annex 1.

.

Table 3. 1: RWH Strategy Implementation Plan

Strategic objective	Proposed strategy	Activities	Deliverables	Indicative Budget (GH₵)	Time Frame			Responsibility	
					2012-2016	2017-2021	2022-2025	Lead	Collaborating
1.0 Develop and implement effective regulatory and institutional frameworks for institutionalization of RWH.	1.1: Review existing regulatory/legal instruments and formulate appropriate legislation framework (including incentives regimes for sustainable financing) for RWH	1.1.1 Review existing building code and policies (Water, Investment, etc.) to identify gaps;	• Legislative and policy review reports by June 2012 • Draft bill on rainwater harvesting incorporating incentive regimes for water conservation by March 2013 • Consultation workshops for the development of the legislation before Jan 2014; • RWH legal framework enacted by Parliament by Dec. 2014	**11,250**				WRC & MWRWH	CWSA, Attorney Generals Department, Institution of Architects, Institution of Engineers, GREDA, Town and Country Planning Department, MMDAs, and NGOs (ADRA, World Vision etc)
		1.1.2 Carry out formulation of RWH legal framework through stakeholders' consultative processes;		**45,000**					
		1.1.3 Organise zonal and national validation workshops to agree on the legal framework		**45,000**					
	1.2: Establish relevant institutional arrangement for effective promotion and coordination of RWH interventions	1.2.1 Carry out stakeholder consultations to Identify all categories of stakeholders	• Stakeholders' role matrix by Aug 2012 • Stakeholders' analysis report by Sept 2012 • RWH programme Unit at WRC by Jan 2013	**45,000**				WRC & MWRWH	CSIR-WRI, GUWL/GWCL, CWSA, MoFA/GIDA, GHA, (HSD), FC and Tourist Authority.
		1.2.2 Conduct Stakeholders' Analysis to define roles and responsibilities		**6,000**					
		1.2.3 Hold validation workshop to promote ownership of strategy		**15,000**					
		1.2.4 Set up the RWH programme Unit at WRC		**Budgetary allocation**					

Strategic objective	Proposed strategy	Activities	Deliverables	Indicative Budget (GH₵)	Time Frame														Responsibility	
					2012-2016				2017-2021					2022-2025					Lead	Collaborating
2.0 Stimulate interest in and promote support for RWH through sustained awareness-creation campaigns	2.1: Establish clear and sustained awareness creation modules for the public and policy-makers	2.1.1 Organize workshops and seminars for public and policy-makers	• Workshops and seminars (at least 2 per year) intended to disseminate information on RWH • Media productions, technical brochures, handbook /guidelines of RWH techniques by Jan 2016 • Exhibitions at local and international conferences (Yearly) • Organize Annual Schools Competitions on radio and televisions • Functioning RWH website by 2015 Network of RWH practitioners	**420,000**															WRC & MWRWH	CWSA, Institution of Architects, Institution of Engineers, GREDA, MMDAs, and NGOs (ADRA, World Vision etc
		2.1.2 Undertake media productions on best practices that promote water conservation (brochures, handbook /guidelines, flyers and leaflet)		**6,000**																
		2.1.3 Disseminate technical materials		**PM**																
		2.1.4 Mount exhibitions at the National Water Forums and water-related conferences		**PM**																
		2.1.5 Organize essay and art competitions at all levels in schools to promote the message of water conservation (including RWH)		**PM**																
		2.1.6 Organize Radio and Television competitions on commemorative events such as World Water Day (March 22), World Environment Day (June 5th), and National Water Forums could also be organized.		**PM**																
		2.1.7 Create a RWH website		**7.000**																
	2.2 Establish RWH pilot schemes	2.2.1 Engage Consultants to undertake feasibility of sites for demo RWH and produce	• At least two prototype RWH schemes	**9,000**															WRC & MWRWH	CWSA, Institution of Architects,

Strategic objective	Proposed strategy	Activities	Deliverables	Indicative Budget (GH₵)	Time Frame														Responsibility	
					2012-2016				2017-2021					2022-2025					Lead	Collaborating
		designs through competitive bidding	implemented by March 2015 • Monitoring reports disseminated to the public by Dec 2017																	Institution of Engineers, GREDA, GWCL, GNFS, MMDAs, NGOs
		2.2.2 Construct demonstration schemes at selected sites		**40,000**																
		2.2.3 Monitor impacts of the demo schemes over two years		**10,000**																
		2.2.4 Conduct technical evaluation and Scale up the pilot schemes		**PM**																
3.0 Strengthen Human and Institutional capacities to carry out key RWH mandates	3.1: Develop and improve national competency in developing (design and construction) and operating RWH system	3.1.1 Carry out training needs assessment of key stakeholders	• Training needs assessment report prepared by June 2013 • RWH training guidelines & Educational materials on design, implementation and monitoring developed by Dec 2013 • Monitoring reports of RWH programme	**25.000**															WRC, MWRWH	Institution of Engineers, Universities, Polytechnics, GREDA, MMDAs, and NGOs (e.g. ADRA, World Vision etc)
		3.1.2 Prepare training guidelines and capacity building plan		**40,000**																
		3.1.3 Support targeted institutions to conduct tailor-made training & technical seminars on RWH for stakeholders.		**225,000**																
		3.1.4 Organise technical exchange programme to countries with long experiences in RWH		**150,000**																
	3.2: Strengthen operational and administrative capacities to manage RWH at	3.2.1 Recruit staff of the PMU base on Terms of Reference (TOR) for the key staff of the PMU & Support Operations and	• Full complement of staff at PMU by March 2013 • Annual stakeholders'	**326,800**															WRC & MWRWH	MLGRD, MOFA, MoFEP, Private Sector, NGO's, CWSA, GUWL

Strategic objective	Proposed strategy	Activities	Deliverables	Indicative Budget (GH₵)	Time Frame														Responsibility	
					2012-2016					2017-2021					2022-2025					
																			Lead	Collaborating
	all levels	maintenance of PMU	Network of Actors' meetings • Network of RWH actors • M&E Plan developed by March 2014																	
		3.2.2 Support the establishment of a Network of practitioners																		
		3.2.3 Organise periodic broad-based consultations for monitoring of progress (e.g. Steering Committee meetings, meetings of RWH Network of Practitioners)		**1,400,000**																
		3.2.4 Develop and implement M&E Plan.		**50,000**																
4.0 Improve knowledge base on technology options and water quality of RWH systems through research	4.1: Promote scientific investigations/research on affordable technologies	4.1.1 Review of existing documents on RWH in the country	• Comprehensive Data on existing and new RWH facilities and their performances with time developed by Dec 2012 • Low-cost affordable RWH designs for poor communities produced by Jan 2016 • Safe and affordable RWH treatment options and guidelines developed by Jan 2016 • Greater acceptability of RWH schemes	**12,500**																WRC & MWRWH	CSIR-WRI, CWSA, Universities, Ghana Standards Authority
		4.1.2 Take inventory and evaluate of exiting RWH technologies in the country to identify gaps in technology																		
		4.1.3 Identify cheaper/durable construction materials and develop appropriate technologies for RWH		**22,500**																
		4.1.4 Monitor water quality of harvested rainwater		**70,000**																
		4.1.5 Develop indigenous/low-cost options for		**18,000**																

Strategic objective	Proposed strategy	Activities	Deliverables	Indicative Budget (GH₵)	Time Frame														Responsibility	
					2012-2016					2017-2021					2022-2025					Lead	Collaborating
		treating harvested rainwater																			
		4.1.6 Identify socio cultural, attitudinal barriers to RWH adoption and ways to correct misconceptions through surveys		**14,000**																
	4.2: Develop standards and guidelines for RWH technology	4.2.1 Organize Experts' meetings to develop guidelines for design and constructing RWH systems based on reports from 4.1	• Inventory of RWH schemes developed by Dec 2012 • Standard designs for storage tanks to be adopted by contractors, plumbers and other service providers developed by Jan 2013 • Construction guidelines for masons, plumbers and other service providers produced by March 2014	**20,000**																WRC & MWRWH	CSIR-WRI, CWSA, Universities, Ghana Standards Authority
		4.2.2 Prepare RWH manuals		**30,000**																

4.0 MANAGING THE IMPLEMENTATION PLAN

4.1 Initial Implementation phase

The NRWHS implementation is proposed to coincide with WSSDP time frame (2012-2025). The strategic actions described in the Action Sheets could therefore be prioritized into actions or initiatives that need to be undertaken in the short-term (0-2 years), medium-term (3-5 years) and long-term (6-14 years).

Until a new legal and institutional framework has been established, the implementation of the strategies will be preceded by a transition phase (5 years) under which several functions related to its implementation will be carried out by existing institutions under the legal and institutional framework of WRC. This will entail working with the present institutions engaged in water resources management (Commissioners of WRC, and its River Basin Boards).

The NRWHS implementation plan (Table 3.1) already identifies the organizations that should take the lead and those that should be actively engaged in these activities. In broad terms, policy and overall oversight and coordination of the water sector is provided by the Water Directorate, while the Water Resources Commission carries out the practical implementation of NRWHS with the assistance of other stakeholders, including key water users, MOFA, GWCL and CWSA.

Over time, a fully fledged long-term RWH implementation programme shall be established under WRC (or other institution to be agreed at that stage), in full collaboration with all interested role-players.

4.2 Institutional roles and responsibilities related to RWH

The institution(s) mandated to oversee RWH either on specific water uses or across all water uses will be required to ensure that RWH satisfy all water needs and not only human needs so that the environment is not disadvantaged and pose further difficulties on man.

For the purpose of implementation, the under-listed roles are recommended;

- The GWCL and CWSA should be responsible for urban and rural water supply respectively.
- MoFA/GIDA should be responsible for developing irrigation reservoirs that harvest rainwater for agriculture.
- The Ghana Highway Authority (GHA) should be responsible for incorporating necessary designs that will include catchment facilities that utilise existing road networks for harvesting rainwater into dugouts and dams for irrigation as well as for ecosystem protection and groundwater recharge systems.
- The Hydrological Services Department (HSD) in collaboration with NADMO will plan and develop detention reservoirs for flood control and disaster management.
- The Forestry Commission (FC), Ghana Tourist Authority (GTA) would be responsible for proposing systems that will enhance ecosystem protection benefits of RWH including appropriate sites for watering holes for wildlife and storage reservoirs that double as recreational facilities for swimming, boat riding and other water sport.

It is proposed that a programme administration capacity (programme management unit) will be created under WRC to coordinate various RWH activities. A RWH Steering Committee (or Management Board) will be established to guide and facilitate all planning and implementation of the activities. The Steering Committee will consist of public, private and civil society leaders representing a diversity of viewpoints with one unified goal for water conservation, water for food security, ecosystem protection, groundwater recharge, and flood/disaster management

Along with the Steering Committee, a Technical Work Team will be formed to provide direct technical support to the Steering Committee. This Work Team will consist of professionals with diverse expertise in irrigation, wetlands management, town planning, architecture, stormwater management, and water resources management. The Technical Team will be responsible for developing effective plans and programs to meet the NRWHS goals.

4.3 Monitoring and Evaluation

To assist in monitoring, evaluation and reporting on progress in the implementation of the NRWHS, some operational and progress indicators have been included in the implementation plan (see Table 3.1), which would be used initially to monitoring progress. The programme management unit (PMU) when established will prepared a comprehensive monitoring and evaluation (M&E) plan as a deliverable of this strategy.

The general internal progress monitoring tools for this strategy will be the quarterly progress reports and annual reports to be compiled by the PMU and presented at the regular Steering Committee meetings.

ANNEX 1: ACTION SHEETS FOR THE NRWHS

National Rainwater Harvesting Strategy – Action Sheet 1		
Objective 1.0	To develop and implement effective regulatory and institutional frameworks for institutionalization of RWH	
Action n° 1.1	**Title of action:** ***Review existing regulatory/legal instruments and formulate appropriate legislation framework (including incentives regimes for sustainable financing) for RWH***	
Justification	The current national water policy as well as the Act that establishes the WRC and indeed all water related regulations do not adequately address or factor the contribution of RWH across all water uses. Rainwater harvesting systems are often not part of the building code and lack clear guidelines for users/developers to follow. There are also no specific provisions in the national investment policy for the granting of incentives or concessions to commercial entities like hotels, hospitals, manufacturing and processing sectors to promote investments in RWH. A legal framework will therefore be crafted to incorporate measures that encourages observance of best practices in water conservation technologies (including RWH), and a harmonized incentive regime that fosters investments in RWH. Support could be provided to multiple uses such as homeowners, private investors and the public institutions (national fire service, schools, hospitals) to foster implementation of RWH.	
Brief description of Tasks	– Review existing legislations (e.g. building code) and policies (investment policy) to identify gaps; – Carry out formulation of RWH legal framework through stakeholders' consultative processes; – Organise zonal and national validation workshops to agree on the legal framework.	
Expected outputs	• Legislative and policy review reports by June 2012 • Draft Bill on rainwater harvesting incorporating incentive regimes for water conservation formulated by March 2013 • Consultation workshops for the development of the legislation completed before Dec 2013; • RWH legal framework enacted by Parliament by Dec. 2014	
Assumptions	• Greater commitment from Government/MWRWH to implement programme • Adequate financial resources and human capacity are available for the actions • There would be timely release of financial resources • Availability of strong RWH champions • Timely approval of RWH legislation by Parliament • The absence of conflicting allies	
Risks	• The 2012 election activities may delay approval of key recommendations • Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time • Conflict of interests from stakeholders could slow or derail progress of RWH implementation ;	
Means for implementation	Logistics (including technical, scientific, etc).	
	Human resources	i. Water Resources/Environmental Law Experts ii. IWRM/RWH Expert iii. Economist iv. Architect v. Building Technologist vi. Sociologist vii. Local government expert viii. Development planners ix. Institution of planners t

<table>
<tr><td>Indicative Cost</td><td>
<table>
<tr><th>Activities</th><th>Cost (GH Cedis)</th></tr>
<tr><td>Review of legislations and policies</td><td>11,250</td></tr>
<tr><td>Formulation of new legislation on RWH</td><td>45,000</td></tr>
<tr><td>Stakeholder Consultations</td><td>15,000</td></tr>
<tr><td>Consultation workshops for development of LI (at least 4)</td><td>30,000</td></tr>
<tr><td>Total</td><td>101,250</td></tr>
</table>
</td></tr>
<tr><td>Recurrent costs</td><td>None</td></tr>
<tr><td>Financial source</td><td>For the action: GoG/MWRWH funding, DP support
For recurrent costs: GoG budgetary allocation, IGF</td></tr>
<tr><td>Responsible for implementation</td><td>Responsible: WRC, MWRWH
Partners: CWSA, Attorney Generals Department, Institution of Architects, Institution of Engineers, GREDA, Town and Country Planning Department, MMDAs, and NGOs (ADRA, World Vision etc).</td></tr>
<tr><td>Beneficiaries</td><td>Communities, MMDAs</td></tr>
<tr><td>Implementation schedule</td><td>Twenty weeks (2012-2025)</td></tr>
<tr><td>Remarks</td><td></td></tr>
</table>

National Rainwater Harvesting Strategy – Action Sheet 2

Objective 1.0	To develop and implement effective regulatory and institutional frameworks for institutionalization of RWH
Action n° 1.2	**Title of action*: Establish relevant institutional arrangement for effective promotion of RWH***
Justification	The institutional establishment, hierarchy and roles should be clearing defined to ensure effective delivery of the technology across all the facets of its implementation. RWH serves various functions including, domestic and industrial water uses, agriculture, livestock and aquaculture water uses, flood protection, ecosystem protection and sustenance of the bio-environment system, as well as recharge of aquifer systems. The institutional set up should be defined to take care of all or most of these needs as part of the requirements of the Integrated Water Resources Management (IWRM) principles.
Brief description of Tasks	• Identify all categories of stakeholders • Carry out stakeholder consultations • Conduct Stakeholders' Analysis to define roles and responsibilities • Hold validation workshop to promote ownership of strategy • Set up the RWH programme Unit at WRC
Expected outputs	• Stakeholders' role matrix by produced by Aug 2012 • Stakeholders' analysis report completed by Sept 2012 • RWH programme Unit at WRC established by Jan 2013
Assumptions	• Greater commitment from Government/MWRWH to implement programme • Adequate human and financial resources and capacity are available for the actions • There would be timely release of financial resources • Availability of strong RWH champions • Commitment of all stakeholders to implement the programme
Risks	• Inadequate funds for implementation • Non cooperation from some key stakeholders • Change in government priorities toward water conservation • Low commitment of all stakeholders • Untimely release of funds by MoFEP
Means for implementation	Logistics (including technical, scientific, etc).: One 4x4 cross country vehicle (hired) Human resources: i. Institutional/Organizational Development Expert; ii. IWRM/RWH Experts
Indicative Cost	
Recurrent costs	Salaries and operational cost of the Programme Unit

Activities	Cost (GH Cedis)
Carry out country-wide stakeholder consultations	45,000
Conduct stakeholders' analysis	6,000
Organise experts' validation workshops	15,000
Purchase of vehicle for the programme	75,000
Total	**141,000**

Financial source	For the action: GoG/MWRWH funding, DP support For recurrent costs: GoG budgetary allocation, IGF
Responsible for implementation	Responsible: WRC, MWRWH Partners: MEST, CSIR-WRI, GUWL/GWCL, CWSA, MoFA/GIDA, NGOs, GHA, HSD, FC and GTA.
Beneficiaries	MWRWH, WRC
Implementation schedule	2012-2013
Remarks	

National Rainwater Harvesting Strategy – Action Sheet 3		
Objective 2.0	Sustained awareness-raising campaigns to stimulate interest and promote support for RWH implemented	
Action n° 2.1	**Title of action:** ***Establish clear and sustained awareness creation modules for public and policy-makers***	
Justification	Water delivery in most urban systems has become erratic and unreliable. Workers scramble for water for long hours before going to work, resulting in the loss of significant and productive man-hours. Schoolchildren also waste precious study hours looking for water. Ministries, Departments and Agencies (MDAs) as well as health and educational institutions often face serious sanitation problems because of lack of water while residents of newly developed estates and peri-urban areas also cry for water. Consequently there has been renewed interest in RWH. Use of various electronic/mass media measures will help promote RWH. Competitions on water conservation issues in schools will also imbibe behavioural change over time	
Brief description of Tasks	• Organize workshops and seminars for public and policy-makers • Undertake media productions on best practices that promote water conservation • Disseminate at least 60% of technical materials produced • Mount exhibitions at the Annual National Water Forums and water-related conferences • Organise essay and art competitions at all levels in schools to promote the message of water conservation (including RWH). • Organize Radio and Television competitions on commemorative events such as World Water Day (March 22), World Environment Day (June 5th), and Annual National Water Forums. • Create a RWH website • Produce technical brochures, handbook /guidelines, flyers and leaflets	
Expected outputs	• Workshops and seminars (at least 2 per year) intended to disseminate information on RWH • Media productions, technical brochures, handbook /guidelines of RWH techniques by Jan 2016 • Exhibitions at local and international conferences (Yearly) • Organize at least one Annual Schools Competitions on radio and televisions • Functioning RWH website in place by 2015 • Network of RWH practitioner put in place by 2016	
Assumptions	• All stakeholders in water sector, especially women and children are well sensitized on their various roles and responsibilities • Stakeholders are willing to change attitude to water use efficiency and conservation • Greater commitment of Government/MWRWH to implement programme • Adequate human and financial resources and capacity are available for the actions • There would be timely release of financial resources	
Risks	• Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time;	
Means for implementation	Logistics (including technical, scientific, etc).	Vehicles, ICT equipment and accessories, stationery, training manuals, electronic/mass media.
	Human resources	i. Communication/ICT Experts ii. IWRM/RWH Expert iii. Social-Scientist

<table>
<tr><td>Indicative Cost</td><td>
<table>
<tr><th>Activities/Annum</th><th>Cost (GH Cedis)</th></tr>
<tr><td>Workshops and seminars (2 per annum)</td><td>420,000</td></tr>
<tr><td>Media Productions (brochures</td><td>6,000</td></tr>
<tr><td>Exhibitions (to be estimated annually)</td><td>-</td></tr>
<tr><td>Schools competitions (to be estimated)</td><td>-</td></tr>
<tr><td>RWH website development (initial linking to the Water and Sanitation Monitoring Platform)</td><td>7,000</td></tr>
<tr><td>Total</td><td>433,000</td></tr>
</table>
</td></tr>
<tr><td>Recurrent costs</td><td>Annual Consultancy Fees of Communication/ICT Expert</td></tr>
<tr><td>Financial source</td><td>For the action: GoG/MWRWH funding, DP support
For recurrent costs: GoG budgetary allocation, IGF</td></tr>
<tr><td>Responsible for implementation</td><td>Responsible: WRC, MWRWH
Partners: CWSA, Institution of Architects, Institution of Engineers, GREDA, MMDAs, and NGOs (ADRA, World Vision etc).</td></tr>
<tr><td>Beneficiaries</td><td>Communities, MMDAs</td></tr>
<tr><td>Implementation schedule</td><td>Annually (2012-2025)</td></tr>
<tr><td>Remarks</td><td></td></tr>
</table>

National Rainwater Harvesting Strategy – Action Sheet 4

Objective 2.0	Sustained awareness-raising campaigns to stimulate interest and promote support for RWH implementation
Action n° 2.2	**Title of action:** ***Establishment of RWH pilot schemes***
Justification	Investing in RWH systems has been constrained to some degree by the initial cost associated with construction of reservoir. Government must show commitment by demonstrating the long-term advantages of RWH through pilot schemes at institutions such as schools, hospitals, hotels and commercial sectors, which utilise large volumes of potable water for largely non-drinking purpose. The National Fire Service should lead in piloting RWH within emerging gated communities to aid fire-fighting. Pilots schemes of the different technology options together with associated costs of construction will: – assist in creating awareness on the long-term benefits of RWH, – Contribute to facilitating the development of appropriate standards for RWH – Contribute to people's resilience to Climate Change impacts
Brief description of Tasks	• Engage Consultants to undertake feasibility of sites for demo RWH and produce designs through competitive bidding • Construct demonstration schemes at selected sites • Monitor impacts of the demo schemes over two years • Conduct technical evaluation and Scale up the pilot schemes
Expected outputs	• At least two prototype Institutional RWH schemes completed by March 2015 • Monitoring reports disseminated to the public by Dec 2017
Assumptions	• Stakeholders are willing to change attitude to water use efficiency and conservation • Greater commitment of Government/MWRWH to implement programme • Adequate human and financial resources and capacity are available for the actions • There would be timely release of financial resources
Risks	• Reduced commitment to sustain and strengthen the Water Directorate; • Lack/Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities because of 2012 elections
Means for implementation	Logistics (including technical, scientific, etc). — Vehicles, ICT equipment and accessories, stationery, training manuals Human resources — i. Civil Engineer/RWH Expert; ii. Construction Technicians; iii. Extension Services Specialists
Indicative Cost	

Activities	Cost (GH Cedis)
Feasibility studies	3,000
Design of pilot schemes	6,000
Construction of schemes	40,000
Monitoring of impacts and production of manuals	10,000
Total	**59,000**

Recurrent costs	None
Financial source	For the action: GoG/MWRWH funding, DP support, Private Sector For recurrent costs: GoG budgetary allocation, IGF
Responsible for implementation	Responsible: WRC, MWRWH Partners: Institution of Architects, Institution of Engineers, GREDA, GWCL, GNFS.
Beneficiaries	Institutions (Schools, Hospital)s, MMDAs, GNFS
Implementation schedule	2012-2013 (see Table 3.1)
Remarks	

National Rainwater Harvesting Strategy – Action Sheet 5		
Objective 3.0	Human and Institutional capacities to carry out key RWH mandates strengthened	
Action n° 3.1	**Title of action:** ***Develop and improve national competency in developing (design and construction) and operating RWH systems***	
Justification	• The action would facilitate acquisition of the appropriate skills mix for planning and implementation of RWH programmes • It would ensure stakeholder commitment to RWH activities • Through this action, there would be injection of professionalism and efficiency in the design and implementation of RWH schemes • Knowledge and awareness of stakeholders will be enhanced and maximise their contribution to IWRM processes • It would ensure equal opportunities for all stakeholders • Will ensure sustainability of RWH programmes	
Brief description of Tasks	− Carry out training needs assessment of key stakeholders − Prepare training guidelines and capacity building plan − Supporting targeted institutions to develop tailor-made training programmes on RWH − Organise technical seminars and training workshops for stakeholders − Organise technical exchange programme to countries with long experiences in RWH	
Expected outputs	• Training needs assessment report prepared by June 2013 • RWH training guidelines & Educational materials on design, implementation and monitoring developed by Dec 2013 • Quarterly reports of RWH programme	
Assumptions	• Greater commitment from Government/MWRWH to implement programme • Adequate financial resources and human capacity are available for the actions • There would be timely release of financial resources • GhIE has the capacity to conduct technical workshop and seminars	
Risks	• The 2012 election activities may be an obstacle to the approval of key recommendations • Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time;	
Means for implementation	Logistics (including technical, scientific, etc).	Office Space 1 4x4 cross country vehicle,
	Human resources	i. Water Resources Engineer ii. Human Resources Management/Institutional Advisor

<table>
<tr><td>Indicative Cost</td><td>
<table>
<tr><th>Activities</th><th>Cost (GH Cedis)</th></tr>
<tr><td>Training Needs assessment, guidelines and training plan</td><td>25,000</td></tr>
<tr><td>Supporting targeted institutions to devlop tailor-made training programmes on RWH</td><td>40,000</td></tr>
<tr><td>Organise technical seminars and training workshops for stakeholders (3 per year)</td><td>225,000</td></tr>
<tr><td>Technical exchange programme to countries with long experiences in RWH</td><td>150,000</td></tr>
<tr><td>Monitoring and evaluation impact of training</td><td>25,000</td></tr>
<tr><td>Total Cost</td><td>465,000</td></tr>
</table>
</td></tr>
<tr><td>Recurrent costs</td><td>Salaries of Staff of PMU</td></tr>
<tr><td>Financial source</td><td>For the action: GoG/MWRWH funding, DP support
For recurrent costs: GoG budgetary allocation, IGF</td></tr>
<tr><td>Responsible for implementation</td><td>Responsible: WRC, MWRWH
Partners: Institution of Engineers, KNUST, GREDA, MMDAs, and NGOs (ADRA, World Vision etc).</td></tr>
<tr><td>Beneficiaries</td><td>Communities, MMDAs</td></tr>
<tr><td>Implementation schedule</td><td>2012-2025 (see Table 3.1)</td></tr>
<tr><td>Remarks</td><td></td></tr>
</table>

National Rainwater Harvesting Strategy – Action Sheet 6

Objective 3.0	Human and Institutional capacities to carry out key RWH mandates strengthened
Action n° 3.2	**Title of action: Strengthen operational and administrative capacities to manage RWH at all levels**
Justification	• The action would facilitate establishment of appropriate operational framework for implementation of RWH programmes • Effective coordination of RWH programmes across sectors will be enhanced • Networking of actors will be initiated and sustained
Brief description of Tasks	− Develop Terms of Reference for the key staff of the Programme Management Unit (PMU) − Recruit staff of the PMU − Organise periodic broad-based consultations for monitoring of progress (e.g. Steering Committee meetings, meetings of RWH Network of Practitioners − Develop and implement M&E Plan
Expected outputs	• Full complement of staff at PMU put in place by March 2013 • Annual stakeholders' Network of Actors' meetings • Network of RWH actors institutionalized by Jan 2015 • M&E Plan developed by March 2014
Assumptions	• Greater commitment from Government/MWRWH to implement programme • Adequate financial resources and human capacity are available for the actions • There would be timely release of financial resources
Risks	• The 2012 election activities may be obstacle to approval of key recommendations • Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time;
Means for implementation	Logistics (including technical, scientific, etc).: 1 4x4 cross country vehicle, Office equipment Human resources: iii. Water Resources/RWH Engineer; iv. Administrative Officer

Indicative Cost

Activities	Cost (GH Cedis)
Staff Salaries	268,800
Operational costs	58,000
Monitoring & evaluation of progress	50,000
Steering Cttee and Partners' meetings	1,400,000
Total Cost	**1,776,800**

Recurrent costs	Salaries of Staff of PMU

Financial source	For the action: GoG/MWRWH funding, DP support For recurrent costs: GoG budgetary allocation, IGF
Responsible for implementation	Responsible: WRC, MWRWH Partners: MLGRD, MOFA, MoFEP, Private Sector, NGO's, CWSA, GUWL.
Beneficiaries	Communities, MMDAs
Implementation schedule	2012-2025 (see Table 3.1)
Remarks	

National Rainwater Harvesting Strategy – Action Sheet 7		
Objective 4.0	Knowledge base on technology options and water quality of RWH systems improved through research.	
Action n° 4.1	**Title of action:** ***Promote scientific investigations/research on affordable technologies***	
Justification	RWH practice in Ghana exists but is poorly documented. There is the need to promote research to identify areas for improvement and adaptation to local conditions. Innovations in alternative materials, water treatment options and cheaper options will be required as new technologies evolve. Through research, RWH schemes will be affordable to all, especially the poor and vulnerable.	
Brief description of Tasks	– Review of existing documents on RWH in the country – Take inventory of existing RWH technologies in the country – Evaluation of existing RWH Systems and Practices – Identify cheaper/durable construction materials and develop appropriate technologies for RWH – Monitor water quality of harvested rainwater – Develop indigenous/low cost options for treating harvested rainwater – Identify socio cultural, attitudinal barriers to RWH adoption and ways to correct misconceptions	
Expected outputs	• Comprehensive Data on existing and new RWH facilities and their performances with time developed by Dec 2012 • Low-cost affordable RWH designs for poor communities produced by Jan 2016 • Safe and affordable RWH treatment options and guidelines developed by Jan 2016 • Greater acceptability of RWH schemes	
Assumptions	• Greater commitment from Government/MWRWH to implement programme • Adequate financial resources are available for research • There would be timely release of technical/financial resources	
Risks	• Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time;	
Means for implementation	Logistics (including technical, scientific, etc).	1 4x4 cross country vehicle, Water quality Lab, water quality field testing kits
	Human resources	i. Water Research Expert (Chemist/Bacteriologist) ii. Socio-Economic Consultant iii. RWH Expert

<table>
<tr><td>Indicative Cost</td><td>
<table>
<tr><th>Activities</th><th>Cost (GH Cedis)</th></tr>
<tr><td>Take inventory and evaluate of exiting RWH technologies in the country to identify gaps in technology</td><td>12,500</td></tr>
<tr><td>Development of cheaper/durable construction materials</td><td>22,500</td></tr>
<tr><td>Monitor water quality of harvested rainwater</td><td>70,000</td></tr>
<tr><td>Identify/Develop indigenous/lo- cost options for treating RWH</td><td>18,000</td></tr>
<tr><td>Socio-economic surveys to identify attitudinal barriers to RWH</td><td>14,000</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total Cost</td><td>137,000</td></tr>
</table>
</td></tr>
<tr><td>Recurrent costs</td><td>Salaries of Staff of PMU</td></tr>
<tr><td>Financial source</td><td>For the action: GoG/MWRWH funding, DP support
For recurrent costs: GoG budgetary allocation, IGF</td></tr>
<tr><td>Responsible for implementation</td><td>Responsible: WRC, MWRWH
Partners: CSIR-WRI, CWSA Universities, Ghana Standards Authority</td></tr>
<tr><td>Beneficiaries</td><td>WRC, MMDAs</td></tr>
<tr><td>Implementation schedule</td><td>2012-2025 (see Table 3.1)</td></tr>
<tr><td>Remarks</td><td></td></tr>
</table>

National Rainwater Harvesting Strategy – Action Sheet 8

Objective 4.0	Knowledge base on technology options and water quality of RWH systems improved through research.
Action n° 4.2	**Title of action:** ***Develop standards and guidelines for RWH technology options***
Justification	The MWRWH should ensure appropriate and adequate standards for the different technology options. Specifically technology options for drinking, domestic and industrial water provision should be clearly spelt out to enable adequate quality assurance. Standards for storage reservoirs (reinforced concrete tanks either above or below ground, ferro-cement tanks, polytanks and other storage systems should be clearly specified indicating what is permissible and what is unacceptable Standard designs for communal water supply, domestic water supply and industrial water supply systems should be produced to aid contractors to produce systems that meet these standards and to ensure that no arbitrary systems are unleashed onto the market.
Brief description of Tasks	– Organize Experts' meetings to develop guidelines for design and constructing RWH systems – Prepare RWH manuals
Expected outputs	• Inventory of RWH schemes published by Dec 2012 • Standard designs for storage tanks to be adopted by contractors, plumbers and other service providers developed by Jan 2013 • Construction guidelines for masons, plumbers and other service providers produced by March 2014
Assumptions	• Stakeholders are willing to change attitude to old ways of doing things • Greater commitment of Government/MWRWH to implement programme • Adequate human and financial resources and capacity are available to support training
Risks	• Reduced commitment to sustain and strengthen the Water Directorate; • Inadequate funds for implementation; • Non cooperation from some key stakeholders; • Change in government priorities over time;
Means for implementation	Logistics (including technical, scientific, etc). : .
	Human resources : i. RWH Consultants
Indicative Cost	

Activities	Cost (GH Cedis)
Development of design standards	12,000
Preparation of RWH guidelines	18,000
Experts' meetings	20,000
Total Cost	**50,000**

Recurrent costs	Salaries of Staff of PMU
Financial source	For the action: GoG/MWRWH funding, DP support For recurrent costs: GoG budgetary allocation, IGF

Responsible for implementation	Responsible: WRC, MWRWH Partners: CSIR-WRI, CWSA ,Universities Ghana Standards Authority
Beneficiaries	WRC, MMDAs
Implementation schedule	2012-2025 (see Table 3.1)
Remarks	