REPUBLIC OF GHANA

# Water Resources Commission

# NATIONAL INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) PLAN

**DECEMBER 2012**

# FOREWORD

Government of Ghana's vision of the water sector is "all people living in Ghana have access to adequate, safe, affordable and reliable water service, practice safe sanitation and hygiene and that water resources are sustainably managed". To achieve this vision, Ghana has been engaged in the introduction of Integrated Water Resources Management (IWRM) at various levels of society in the management, development and utilization of its water and land resources, and is considerably advanced in the IWRM process resulting in a national water policy and legislations facilitating water resources management and development. Furthermore, an enabling institutional framework has been introduced at national level, i.e. establishment of the Water Resources Commission (WRC) and the Water Directorate under the Ministry of Water Resources, Works and Housing, and at local river basin level in the form of creation of river basin boards. In parallel to the organizational arrangements, activities of a more technical and hydrological nature have been undertaken by WRC with support from various stakeholders and Development Partners.

WRC's priority task has been to introduce the principles of IWRM at both local and national levels. Six River Basin plans have been developed since 2007 and these have provided vital inputs towards the development of this National IWRM plan. This National IWRM Plan sets out the direction and implementation framework for the legal and institutional development to achieve the overall goal of the water resources management part of the National Water Policy. It outlines the need for the sustainable management of all the river basins and related natural resources in line with the provisions of the WRC's mandate (Act 522 of 1996) and in the context of emerging climate change and trans-boundary issues. This plan should also be viewed as an integral part of the stipulations in the WRC Act to "propose plans for utilization, conservation, development and improvement of water resources" in adherence with the overall National Water Policy.

The Plan has been prepared through a consultative and participatory process involving all key sector stakeholders, and will undoubtedly serve as a reference document for the management of water resources in Ghana. It is intended to guide and urge the different stakeholders involved in water resources management at different levels to incorporate IWRM in their plans, making IWRM an integral part of their development programs, and improve their institutional capacity for water resources management.

The Commission expresses its sincere appreciation to all those who worked tirelessly to produce this very important plan and to the European Union and all the Development Partners who supported the process. Finally, the Commission sincerely hopes that this plan will be a useful catalyst towards accelerating concrete IWRM activities in Ghana for sustainable socio-economic development.

***Paul Derigubaa***
***Chairman, Water Resources Commission,***
***Accra, December 2012***

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| | |
|---|---|
| ADRA | Adventist Development Relief Agency |
| AfDB | Africa Development Bank |
| AMCOW | African Ministers' Council on Water |
| CC | Climate Change |
| CIDA | Canadian International Development Agency |
| CONIWAS | Coalition of NGOs in Water and Sanitation |
| CRS | Catholic Relief Services |
| CSIR | Council for Scientific and Industrial Research |
| CWSA | Community Water and Sanitation Agency |
| DANIDA | Danish International Development Assistance |
| DFID | Department for International Development (UK) |
| DHMT | District Health Management Team |
| DP | Development Partners |
| DSS | Decision Support System |
| DWST | District Water and Sanitation Team |
| EDF | European Development Fund |
| EPA | Environmental Protection Agency |
| EU | European Union |
| FC | Forestry Commission |
| GAEC | Ghana Atomic Energy Commission |
| GEF | Global Environment Facility |
| GIDA | Ghana Irrigation Development Authority |
| GIS | Geographic Information System |
| GMet | Ghana Meteorological Authority |
| GoG | Government of Ghana |
| GWCL | Ghana Water Company Limited |
| GWP | Global Water Partnership |
| HES | Hydro-Environ Solutions Ltd. |
| HSD | Hydrological Services Department |
| IGF | Internally Generated Funds |
| IMSC | Inter-Ministerial Steering Committee |
| IWRM | Integrated Water Resources Management |
| IWSPMF | Improvement of Water Sector Performance Management Framework |
| JICA | Japan International Cooperation Agency |
| KPI | Key Performance Indicators |

| | |
|---|---|
| LC | Lands Commission |
| LFA | Logical Framework Analysis |
| LGSC | Local Government Service Commission |
| LI | Legislative Instrument |
| LVB | Lands Valuation Board |
| M&E | Monitoring and Evaluation |
| MC | Minerals Commission |
| MDAs | Ministries, Departments, and Agencies |
| MDGs | Millennium Development Goals |
| ME | Ministry of Energy |
| MFA-RI | Ministry of Foreign Affairs & Regional Integration |
| MJ-AGD | Ministry of Justice & Attorney General's Department |
| MLGRD | Ministry of Local Government and Rural Development |
| MLNR | Ministry of Lands and Natural Resources |
| MMDAs | Metropolitan, Municipal and District Assemblies |
| MOFA | Ministry of Food and Agriculture |
| MOH | Ministry of Health |
| MoU | Memorandum of Understanding |
| MOWAC | Ministry of Women and Children's Affairs |
| MWRWH | Ministry of Water Resources, Works and Housing |
| NADMO | National Disaster Management Organisation |
| NDPC | National Development Planning Commission |
| NWP | National Water Policy |
| NWV | National Water Vision |
| PURC | Public Utilities and Regulatory Commission |
| RBBs | River Basin Boards |
| RCCs | Regional Coordinating Councils |
| SEA | Strategic Environmental Assessment |
| SIP | Strategic Investment Plan |
| SWAp | Sector Wide Approach |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNICEF | United Nations Children Fund |
| USAID | United States Agency for International Development |
| VBA | Volta Basin Authority |
| VRA | Volta River Authority |
| WASH | Water, Sanitation and Hygiene |

| | |
|---|---|
| WATSANS | Water and Sanitation Teams |
| WB | World Bank |
| WD | Water Directorate |
| WRC | Water Resources Commission |
| WRI | Water Research Institute (CSIR) |
| WRIS | Water Resources Information Services |
| WRM | Water Resources Management |
| WSMP | Water and Sanitation Monitoring Platform |
| WSSD | World Summit for Sustainable Development (2002) |
| WSSDP | Water Sector Strategic Development Plan |
| WSSPS | Water Supply and Sanitation Programme Support (DANIDA) |

# EXECUTIVE SUMMARY

By developing the present National IWRM Plan, Ghana is following the formal international recommendations (WSSD Plan of Implementation) as well as the agreements made by the ECOWAS countries on developing IWRM through national planning. However, Ghana has during the years from the first conceptual emergence of IWRM in the early 1990s, put in place a good part of the basic political, legal and institutional frameworks, which eventually will sustain the implementation of IWRM in the country. Some notable programmes and actions already in place include: - i) the establishment of the Water Resources Commission by an Act of parliament in 1996; ii) the adoption of the 2007 National Water Policy (NWP); iii) the development of five national river basin IWRM plans and four corresponding River Basin Boards (RBBs) between 2003 and 2011; and iv) the active involvement with neighbouring countries on trans-boundary issues on the Volta Basin. In addition, substantial capacity building has taken place within the key institutions involved in water resources management over the past 15-20 years.

Ghana's approach to implementation of IWRM has gone through strengthening basic parts of the central "Enabling Environment" and by initiating the planning from the river basin level, starting with the most "water stressed" basins of the country. At a later stage, the lessons learnt in implementing these basin plans have provided input to further basin planning and to the preparation of the National IWRM Plan which role actually is to fill the institutional gaps after more basic IWRM functions already have been implemented and lessons learned.

The National IWRM Plan shall be seen in the context of the overall development planning and in particular the water sector planning in Ghana. Thus, the overarching planning framework is the "Ghana Shared Growth and Development Agenda" under which sectoral policies and development plans are elaborated. For the water sector, the next level is the NWP (adopted in 2007). The NWP in Ghana covers both the productive part of the water sector (water supply and sanitation) and the cross-sectoral water resources management part (IWRM). Therefore, the Water Sector Strategic Development Plan (WSSDP) being the implementation framework for the NWP consists of three separate strategic planning components, namely i) The national IWRM Plan ii) The Urban Water Supply Strategy, and iii) The Rural Water Supply and Sanitation Strategy. The nature of these plans and strategies are different. Whilst the focus of the IWRM component is about setting the cross-sectoral legal and institutional management functions at national and basin level, the water supply and sanitation components include investment infrastructural programmes for water development.

The Plan document provides sections with summaries of the current baseline situation with respect to the socio-economic context, the bio-physical context, the water resources potential, the water demands, the sharing of water with neighbouring countries as well as the current management framework as defined by legal instruments in place and roles and functions of institutions.

The water resources situation analysis reflects the fact that Ghana is basically well endowed with significant freshwater resources both compared to current uses and demands in the foreseeable future. However, 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). Moreover, the resources are at risk of depletion and degradation, and problems are emerging because of: -

- *Uncontrolled catchment degradation* due to poor agricultural practices (especially farming along river banks), population pressure (forest excision for resettlement and industrialisation), deforestation (for agricultural land and fuel wood) and surface mining, which invariably affect surface water availability as well as quality.
- *Pressure due to Climate Change and Climate Variability*, which makes the natural flow of water in the river channels highly variable. Fresh water regimes have been modified resulting in shrinking of the resources, and affecting water supply and river transport. Major recent floods that affected most communities, especially the northern part of Ghana occurred in 2007, 2008 and 2010. Major drought periods have been recorded every 7-10 years with the severest occurring in 1981-1985 and 1998-2000.
- *Increasing population growth and urbanisation* has also set a heavy demand on land, water and other natural resources and induces conflicting and competing water uses and pollution.

Although much has been done in order to develop the legal and institutional framework for management of Ghana's water resources, the country is still facing a number of challenges in order to meet the current and upcoming issues. Among these can be mentioned:

- Weak enforcement of existing regulations or permits;
- Regulations are lacking on dam safety and control of discharge of effluent from industry and sewage outfalls;
- There is lack of adequate data and information on surface and groundwater quantity as well as water quality;
- Climate change and climate variability impacts on water and other natural resources are inadequately described and insufficiently incorporated in sectoral water management strategies;
- Many activities in river basins leading to catchment degradation and poor water quality are unregulated (e.g. buffer zone policy needs to be implemented);
- Systems for early warning and mitigation of effects from floods and droughts are inadequate;
- New protocols with Côte d'Ivoire on the joint management of the (Aby Lagoon-Bia-Tano) basins system and with Togo on shared groundwater resources are yet to be established;

- There are inadequate skilled human resources for IWRM at all levels.

The process leading to the final action programme included a tight collaboration with major stakeholders and national experts. It comprised stakeholder consultations on perceived water resources management issues, Strategic Environmental Assessment (SEA) of water resources issues, management solutions and sustainability tests, expert meetings on identified issues, prioritisation of issues and actions, and final validation by stakeholders of priority issues and actions.

Thus, six overarching policy objectives have been identified for the action programme, and ten strategic outcomes have been formulated to support the policy objectives. Each outcome is supported by actions (total of 31) that the WRC will lead in the implementation in collaboration with partners.

| **Policy objectives** | **Strategic outcomes** | **No. Actions** |
|---|---|---|
| 1 Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change | *1.1 Enhance the policy framework for IWRM* | 1 |
| | *1.2 Enhance the implementation of existing regulations on WRM* | 2 |
| | *1.3 Develop and implement additional regulations on Dam Safety and Effluent discharges* | 4 |
| | *1.4 Ensure the protection and conservation of river basins and wetlands for water security as well as enhanced resilience and adaptation to climate change* | 7 |
| 2 Enhance public awareness and education in water resource management issues | *2.1 Strengthen communication campaigns and education to stimulate interest and promote support for WRM-related initiatives* | 3 |
| 3 Improve access to water resources knowledge base to facilitate water resources planning and decision making | *3.1 Improve data and information management* | 5 |
| | *3.2 Promote scientific investigations and research in water resources assessment, management and development.* | 4 |
| 4 Improve transboundary and international cooperation in the management of shared water resources | *4.1 Facilitate the development of bilateral and multilateral agreements/ protocols to strengthen cooperation with riparian countries in shared basins* | 2 |
| 5 Ensure gender equity in water resources management and planning | *5.1 Ensure gender equity in water resources management* | 1 |
| 6 Develop and operationalise a national M&E system to track | *6.1 Set-up a national M&E system for the implementation of IWRM* | 2 |

| | | |
|---|---|---|
| progress in IWRM implementation | | |

Water resources management concerns are cross cutting, and to achieve the planned outcomes will necessitate a concerted effort to influence other sectors.

The successful implementation of the plan will rely on existing structures and institutions as much as possible. WRC has already developed a high level of collaboration with agencies and stakeholders, which will be maintained and further, strengthened. Cooperation and delegation of responsibilities will take place rather than creation of new organisational units.

In broad terms, policy and overall oversight and coordination is provided by the Water Directorate (WD), while the WRC carries out the practical implementation of IWRM with the assistance of other stakeholders.

The WD is leading the process of institutionalizing the sector-wide approach (SWAp) towards the coordination of policies, plans and programmes in the water sector. The approach would strengthen linkages between sector programmes and the IWRM Plan, budgeting and evaluation processes at all levels.

The WRC is composed of the major water-related regulators, data management institutions, and water users and thus provides a forum for integration and balancing of different interests.

At the decentralised level, MMDAs, NGOs/Community Based Organisations (CBOs) and other civil society groupings that work together within a river basin are engaged to take charge and coordinate water resources management activities as far as feasible following the principle of "management at lowest appropriate level". This is done through the RBBs as the water resources management structure for each major river basin in the country.

Finally, monitoring and evaluation (M&E) are key elements in the implementation of the IWRM Plan. Through M&E, progress towards goals and objectives can be tracked and lessons captured to improve performance. Operational and progress indicators (Output Indicators) shall be identified as part of the plan implementation.

The major internal progress monitoring tools proposed are the quarterly progress reports and annual sector performance reports to be compiled by the WD and WRC secretariat and presented at the regular sector working group meetings. Annual review meetings will be organised and the participants will be drawn from key sector institutions, Development Partners, collaborating Partner Ministries, and District and Local Government representatives.

The Plan will be evaluated as part of the evaluation system of the Water Sector Strategic Development Plan.

# CHAPTER 1 INTRODUCTION

## 1.1 IWRM in the International Context

The process of Integrated Water Resources Management (IWRM) is now a well-established international practice, which is key to meeting the challenges of rapidly growing urban water demands and wastewater discharges; to securing water for increased food production; to reducing vulnerability to floods and droughts; to reducing risk to human health and protection from diseases and hazards; to ensuring water for industry and other economic activities; and to protecting the resource base and vital ecosystems from negative impacts of developments.

> **Integrated Water Resources Management (IWRM)** is a process that promotes the coordinated development and management of water, land and related resources, in order to maximize economic and social welfare in a balanced way without compromising the sustainability of the ecosystems.
>
> IWRM is not an end in itself but a means of achieving three key strategic objectives of ***Efficiency*** (attempt to maximize the economic and social welfare derived not only from the water resources base but also from investments in water service provision); ***Equity*** (in the allocation of scarce water resources and services across different economic and social groups) and ***Sustainability*** (as the water resources base and associated ecosystems are finite).
>
> *Global Water Partnership, 2000*

**Box 2: Definition of IWRM by GWP**

The term integrated water resources management has been subject to various interpretations, but the definition by the Global Water Partnership (GWP)[1] has been adopted in the Ghanaian context (see Box 1).

Due to competing demands for the water resource (in the worst case resulting in limiting economic development, decreasing food production, or basic environment and human health and hygiene services), the IWRM process is intended to facilitate broad stakeholder input in order to build compromise and equitable access. This is particularly the case for a developing country like Ghana, which allocates much effort in addressing poverty reduction and in achieving the UN Millennium Development Goals (MDGs).

At the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002 (Rio+10), the international community took an important step towards more sustainable patterns of water management by including in the WSSD Plan of Implementation, a call for all countries to "develop integrated water resources management and water efficiency plans" (the IWRM 2002 Target). The "water efficiency plan" is considered as an important component of IWRM, and hence as an integral part of an IWRM plans. The goal of preparing IWRM plans as called for at the WSSD set the tone for a worldwide initiative, building on principles, which already at that time was adopted by Ghana through sub-regional agreements and national processes.

[1]Global Water Partnership (GWP): Integrated Water Resources Management, Technical Advisory Committee, TEC Background Paper No. 4 (2000)

## 1.2 IWRM Planning in the Sub-regional Context

The founding event for adoption of IWRM in the West African sub-region actually took place four years before the WSSD namely the "West African Ministerial Conference on IWRM" held in Ouagadougou 3-5 March 1998. The Conference developed a report on the status of water resources and their management within the member countries of the Economic Community of West African States (ECOWAS). The Conference produced two important outcomes:

- An awareness among water experts and decision makers of the sub-region about the necessity and urgency for change in the way of managing the water resources, in order to reverse the increase of scarcity and degradation of the resources and the following serious socio-economic and environmental consequences.

- The adoption by the Ministers in charge of water of the ECOWAS countries of the "Ouagadougou Statement" which marked the broad introduction of IWRM in the sub-region (Box 2).

The Ouagadougou Statement laid the ground for a sub-regional follow-up process including the development of a sub-regional action plan for IWRM, a sub-regional Water Policy as well as the establishment of a West African Coordination Framework for IWRM (under ECOWAS) including a Ministerial Committee, a Technical Committee, and a sub-regional Water Resources Coordination Centre in Ouagadougou. Ghana has played an active role this sub-regional process from the very beginning.

**Box 2: The Ouagadougou Statement**

We, the Ministers and Heads of Delegations, responsible for water resources and participating in the West African Conference on Integrated Water Resources Management held in Ouagadougou from 3rd to 5th March 1998, having considered the different aspects of present water resources management in our countries, particularly the following main issues:

- Formulation of policies, legislation, regulations, standardization and their implementation within the appropriate institutional framework;
- Development of capacity, including instruments for planning, co-ordination and evaluation;
- Decentralization and de-concentration, participatory approaches, and the role of users, stakeholder groups and civil society
- Regional conventions and their implication for national legislation;
- Consultation among West African countries on shared basins;
- Scientific and technical co-operation: education and training, studies, research, information exchange between laboratories, etc.;

Acknowledging that our countries are confronted with various problems related to water, which increase over the years, and lead to situations which constrain their economic and social development: water shortage, water related diseases, floods, etc.
Acknowledging that the main causes of these problems are: Rapid population growth, poverty, drought

and desertification, sub-sectoral management of water resources, etc.

Acknowledging that the solution to these severe problems necessarily call for integrated water resources management, an action plan for the water sector, and concerted action by the African countries following the main principles of water resources management outlined in the document **"Agenda 21"** from the United Nations' Conference on Environment and Development in Rio.

Stressing the lack of follow-up in the implementation of several declarations already adopted on management of our water resources

Convinced that integrated management of our water resources is an important factor for sustainable development of our countries.

Urge our governments to:

- Implement in our respective countries a process of integrated water resources management based on National Water Action Plans;
- Create a framework for regional co-operation on integrated water resources management; harmonization of policies and legislation on water issues and exchange of experience;
- Create or re-vitalize the consultative frameworks between riparian countries for joint management of shared basins;
- Prepare national and regional strategies for mobilization of financial resources required for integrated water resources management.

Express our recognition to bilateral and multilateral co-operation partners for their efforts already made for the benefit of our people in their daily struggle for a better life.

Call on our partners for development for technical and financial support to meet the important challenge of integrated water resources management, in particular concerning the knowledge and management of the resources, and the establishment of regional co-operation and a water partnership.

Decide to establish a follow-up committee at ministerial level, responsible for making the recommendations of the Ouagadougou Conference operational, and mandate the Government of Burkina Faso to take the initiative to convene the first meeting of the follow-up committee.

Mandate the Government of Burkina Faso to present this Statement, as well as the conclusions of the West African Conference on Integrated Water Resources Management, at the international conference

"Water and Sustainable Development" in Paris.

Adopted in Ouagadougou the 5th March 1998 by the Ministers of Burkina Faso, Ghana, Mali, Niger and Senegal, and the Heads of the delegations from Benin, Gambia, Guinea, Mauritania, Nigeria and Togo.

## 1.3 The IWRM Plan and the Ghana Water Sector Planning

The National IWRM Plan shall be seen in the context of the overall development planning and in particular the water sector planning in Ghana. Thus, the overarching planning framework is the "Ghana Shared Growth and Development Agenda" under which sectoral policies and development plans are elaborated. For the water sector, the next level is the NWP (2007). The NWP in Ghana covers both the productive part of the water sector (water supply and sanitation)

and the cross-sectoral water resources management part (IWRM). Therefore, the Water Sector Strategic Development Plan (WSSDP) being the implementation framework for the NWP consists of three separate strategic planning components, namely i) The national IWRM Plan ii) The Urban Water Supply Strategy, and iii) The Rural Water Supply and Sanitation Strategy. The nature of these plans and strategies are different. Whilst the focus of the IWRM component is about setting the cross-sectoral legal and institutional management functions at national and basin level, the water supply and sanitation components include investment infrastructural programmes for water development.

The National IWRM plan is fully integrated in the WSSDP, which addresses the following programme areas for the period 2011-2025 (see Annex A for a full summary):

**Institutional Development and Capacity Building (sector wide)**

- Improve institutional capacity across all levels and ensure that all institutional structures perform their roles efficiently and effectively

**Finance (sector wide)**

- Ensure sustainable financing of investment and operation and maintenance cost in the water sector

**Water Services Delivery**

- Improving access to potable water services (achieve national water coverage of 80% by 2015 and 100% by 2025)

**Water Related Sanitation and Hygiene**

- Maximise health benefits through integration of water, sanitation and hygiene education interventions

***Water Resources Management***

- *Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change*
- *Enhance public awareness and interest in water resource management issues*
- *Improve access to water resources knowledge base to facilitate water resources planning and decision making*

**Research, Gender, Governance and M&E (sector wide)**

- Promote generation, sharing and utilization of knowledge relevant to the water sector
- Provide evidence-based data and knowledge to improve decision making in the water sector
- Ensure gender equity in participation in water and sanitation issues at all levels
- Ensure that the water sector operates in a transparent and accountable manner
- Ensure an effectively harmonised and aligned water sector

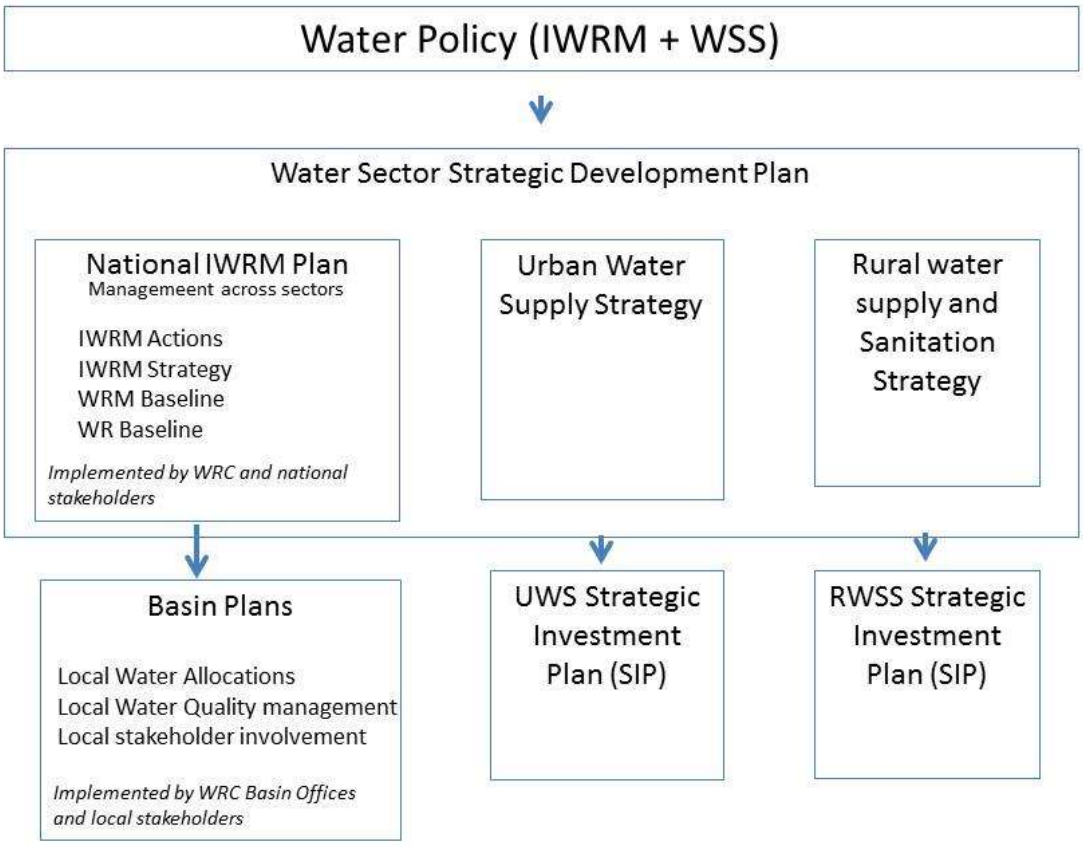



**Figure 1.1 Strategy and planning framework within the water sector in Ghana**

## 1.4 Process of Developing the National IWRM Plan

The development of the National IWRM plan was undertaken in tight collaboration with major stakeholders and national experts and with the assistance of national and international consultants. The process included baseline studies, assessment of national water resources situation, stakeholder consultations through Strategic Environmental Assessment (SEA) on perceived water resources management issues, expert meetings on identified issues, prioritisation of issues and actions, and final validation by stakeholders of priority issues and actions.

# CHAPTER 2 SOCIO-ECONOMIC PROFILE AND WATER RESOURCES SITUATION

## 2.1 General Context

Water in its various occurrences, management and uses, is an essential component of human development and is a cross-cutting factor in current development priorities driving Ghana's goal of achieving sustainable development. It is acknowledged globally that an integrated approach to water resources management is critical for achieving many of the MDGs, including not only those related to health, but also to poverty and hunger eradication, education, women's empowerment, and environmental sustainability. The following sections give a brief description of the availability of the existing water resources in Ghana, their quality and the current and projected demands.

## 2.2 Socio-economic Context

*Population*

According to Ghana Statistical Service (2002) the total population of Ghana in 2000 stood at around 19 million. According to the 2010 census the total population is in the region of 24 million. The annual intercensal rate of growth for the country has declined from 2.7 percent in 2000 to 2.4 percent in 2010.

Ghana's age structure is typically characterised by a large proportion of children (<15 yrs) and a small proportion of elderly persons (>64 yrs). The proportion of the population under 15 years in 2000 was 41.3%.

The current total fertility rate is about 4.5 children per woman (i.e. the average number of children by women aged 15-45 yrs).

There has been a substantial increase in the level of urbanization since 1984 (43.8% in 2000 compared to 32.0% in 1984). However, the population of Ghana continues to be predominantly rural. Indeed, apart from Greater Accra (87.7%) and Ashanti (51.3%) regions, the rest of the country remains predominantly rural with none of the 8 remaining regions having a level of urbanization that is above the national average (Table 2.1).

**Table 2.1 Urban and Rural Population Distribution**

| Year | Population | Rural (%) | Urban (%) |
|---|---|---|---|
| **1970** | **8,559,313** | **71.1** | **28.9** |
| **1984** | **12,296,081** | **68.0** | **32.0** |
| **2000** | **18,912,079** | **56.2** | **43.8** |

Source: Ghana Statistical Service, 2002

*GDP per Capita and Distribution of GDP per sector*

The total GDP of Ghana is $74.77 billion (2011 estimate) corresponding to a GDP per capita of 3,100 USD PPP (Purchasing Power Parity). The GDP growth rates for the period 2001–2004 were in the range of 4-6%/year. However, in the latest years Ghana has experienced very high economic growth rates (7.7% in 2010 and 13.5% in 2011) placing Ghana among the three fastest growing economies in the world.

The agricultural sector remains the largest contributor to the GDP. It is followed by the services sector and industrial sector. The contributions of the main economic activity sectors for the period 2000-2004 are presented in Table 2.2

**Table 2.2 Contributions to GDP by Kind of Economic Activity (in percentages)**

| **Economic Sector** | **2000** | **2001** | **2002** | **2003** | **2004** |
|---|---|---|---|---|---|
| **Agriculture** | **35.27** | **35.24** | **35.15** | **36.38** | **37.94** |
| Crops And Livestock | 22.01 | 22.25 | 22.43 | 22.35 | 22.12 |
| Cocoa Sub-sector | 4.81 | 4.58 | 4.36 | 5.77 | 7.60 |
| Forestry & Logging | 3.89 | 3.92 | 3.94 | 3.95 | 3.98 |
| Fishing | 4.57 | 4.49 | 4.42 | 4.30 | 4.24 |
| **Industry** | **25.40** | **25.22** | **25.28** | **25.10** | **24.74** |
| Mining & Quarrying | 4.98 | 4.72 | 4.72 | 4.68 | 4.59 |
| Manufacturing | 9.02 | 9.00 | 9.03 | 8.94 | 8.75 |
| Electricity & Water | 2.69 | 2.70 | 2.69 | 2.66 | 2.59 |
| Construction | 8.71 | 8.79 | 8.83 | 8.79 | 8.8 |
| **Services** | **28.82** | **29.16** | **29.21** | **28.94** | **28.65** |
| Transport, Storage & | 4.29 | 4.36 | 4.41 | 4.41 | 4.44 |
| Wholesale, Retail Trade | 6.72 | 6.80 | 6.87 | 6.82 | 6.81 |
| Financial & Business | 4.26 | 4.28 | 4.32 | 4.30 | 4.29 |
| Government Services | 10.06 | 10.17 | 10.08 | 9.92 | 9.69 |
| Community, Social & | 2.56 | 2.62 | 2.62 | 2.58 | 2.56 |
| Producers of Private Non- | 0.94 | 0.93 | 0.92 | 0.90 | 0.87 |
| **Net Indirect Taxes** | **10.51** | **10.38** | **10.36** | **9.14** | **8.66** |

Source: Ghana Statistical Service, 2004

*Health*

Basic health sectors indicators including access to health and statistics on water diseases are presented in Table 2.3:

**Table 2.3 Basic Health Sector Indicators**

| Indicators | Value | Data Unit | Year | Source |
|---|---|---|---|---|
| Immunization coverage (DPT3) | 69.4 | % | 2003 | DHS, WDR 2004 |
| Child malnutrition (underweight) | 35.8 | % | 2003 | DHS, WDR 2004 |
| Infant Mortality | 62 | Per 1,000 | 2004 | Min. of Health 2005 |
| Physicians per number of people | 0.06 | Per 1,000 | 1996 | World Bank, 2004 |
| Access to health care | 57.6 | % | 2003 | CWIQ Preliminary Report, 2003 |
| TB estimated cases | 43,104 | number | 2002 | WHO/TB Control Report, 2004 |
| Malaria cases | 17,143 | Per 100,000 | 2001 | WHO/RRM, 2004 |
| Guinea Worm cases | 8,290 | Number | 2003 | Min. of Health, 2004 |
| Guinea Worm cases | 7,275 | Number | 2004 | Min. of Health, 2004 |

## 2.3 Bio-physical Context

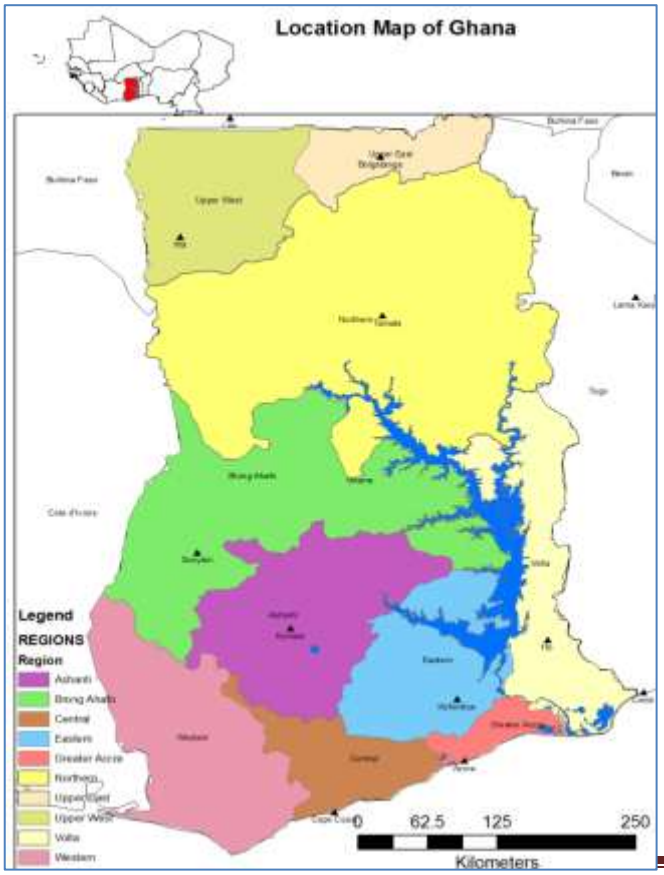



**Figure 2.1 Location of Ghana in West Africa**

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 $11^0$N. 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).

The high population growth imposes increased demand on water and other natural resources exploitation, such as for agricultural land, fuel-wood and land for development to an extent that threatens fragile ecosystems.

There are six ecological zones 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.

Rainfall distribution is bimodal in the forest, transitional and coastal zones, giving rise to a major and a minor growing season. In the remaining two ecological zones (coastal savannah and the savannah), the unimodal rainfall distribution gives rise to only one growing season.

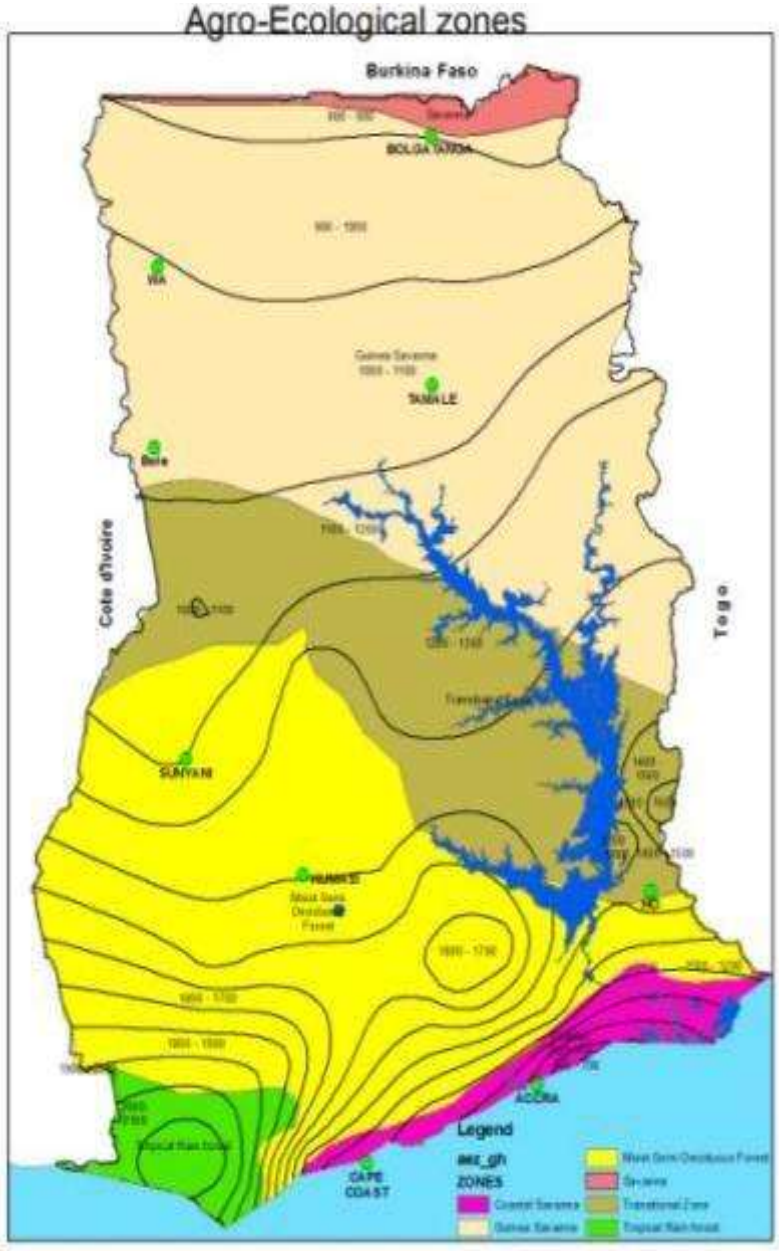



**Figure 2.2 Ecological zones of Ghana and rainfall distribution**

## 2.4 Water Resources Potential

*Surface Water availability*

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 283.1km$^3$ (1200 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 2.4).

**Table 2.4 Water Resources Availability**

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

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

Three main river systems, namely the Volta Basin, South-Western Basins and Coastal Basin systems drain the country, covering 70%, 22% and 8% of Ghana's land surface respectively (Figure 2.3). The Oti, Daka, White and Black Volta Rivers, as well as the Pru, Sene and Afram rivers make up the Volta River system. The Bia, Tano, Ankobra and Pra rivers constitute the South-Western Basins, while the Coastal system comprises of the Ochi-Amissah, Ochi-Nakwa, Ayensu, Densu and Tordzie/Aka rivers. The Volta River Basin is shared with Côte d'Ivoire, Burkina Faso, Togo, Benin and Mali.

In addition to the river basin systems is the only significant natural freshwater lake in Ghana, Lake Bosomtwi. It is a large crater lake of average depth of 4.5 m, 8.4 km across and a surface area of about 49 km$^2$. It is situated at nearly 30 km south-east of Kumasi and is a popular tourist facility.

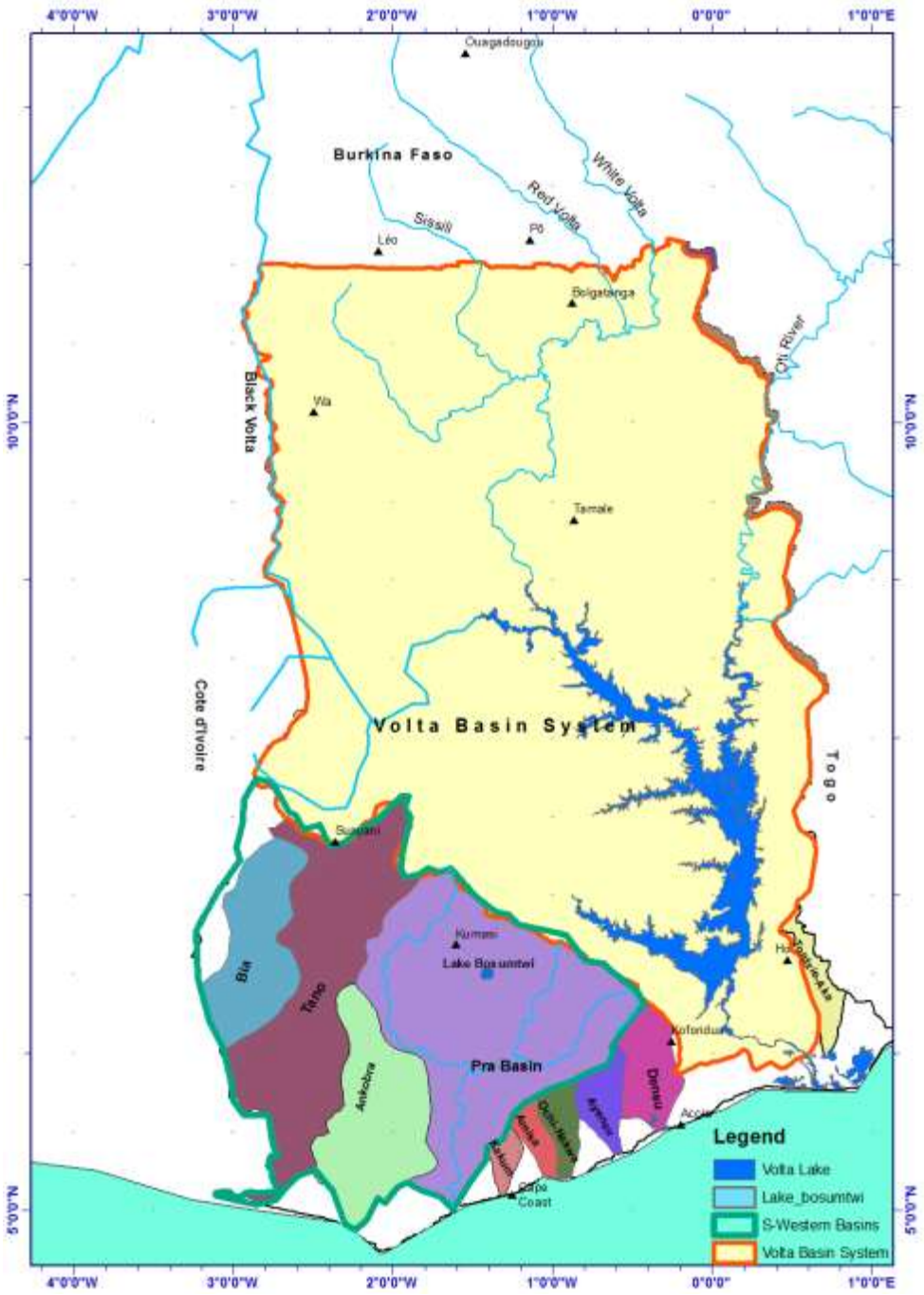



**Figure 2.3 The River Systems of Ghana**

Impoundments and reservoirs have been constructed for hydropower generation, water supply and irrigation. At Akosombo, about 100 km from the confluence of the Volta and the Sea, the first hydroelectric dam was constructed in 1964, which has created one of the largest man-made lakes in the world, covering an area of about 8,500 $km^2$ and a water volume capacity of 148 $km^3$. A smaller impoundment at Kpong (about 20 km downstream of Akosombo), was completed in 1981. The Kpong head-pond covers an area of about 40 $km^2$.

Hydroelectricity is the primary source of Ghana's power and the current hydroelectric capacity of 1.072 GW stem from the Akosombo (912 MW, Figure 2.4) and the Kpong (160 MW). The Government of Ghana is considering additional hydroelectric projects to be built including the Bui hydroelectric project located on the Black Volta, which is almost completed. This dam has a generation capacity of 400 MW. In addition to increasing the domestic electricity supply, power generated from Bui could be exported to neighbouring countries. A second potential facility, located on the Pra River, would have a total generating capacity of 125 MW.

**Figure 2.4 The Akosombo Dam**

Other major impoundments are the Weija (water supply for Accra), the Barekese and Owabi (water supply for Kumasi) on the Rivers Densu and Offin respectively.

The impoundments also serve irrigated agriculture. The total water managed area is about 6,400 ha (1999 data from FAO). This area corresponds to the full or partial controlled irrigated area, as there are no reliable data relative to the existing wetlands and Inland Valley Systems. On the major part (5,800 ha), surface irrigation is practiced, while sprinkler irrigation is used on 580 ha. Large-scale irrigation schemes (> 500 ha) cover 4,700 ha; medium-scale irrigation schemes (100-500 ha) cover 1,200 ha, while small-scale schemes (< 100 ha) cover 450 ha. The developed area is solely irrigated by surface water, through gravity, pumping or a combination. The area actually irrigated may only be 4,000 ha, as a large part of the equipped area is not currently in use. Thus, the irrigation potential of Ghana is far from developed (estimated to about 500,000 ha). The Ghana Irrigation Development Authority is overseeing further development of this sector.

The general characteristics of reservoirs in Ghana are summarised in Table 2.5.

**Table 2.5 Characteristics of the major impoundments**

| Location of Dam | River | Basin | Capacity (X 1,000 $m^3$) | Annual Energy Produced (Gwh)/ Irrigation Surface/ Abstraction Rate |
|---|---|---|---|---|
| Akosombo | Main Volta | Volta | 148 $km^3$ | 912MWh |
| Kpong | Main Volta | Volta | | 160MWh<br>4000ha (for irrigation) |
| Kpong Water Works | Volta Lake | Volta | 232,588.17 | 77,530,000 $m^3/y$ |
| Weija | Densu | Densu | 190,000 | |
| Barekese | Offin | Pra | 89,588.52 | 29,862,840 $m^3/y$ |
| Owabi | Offin | Pra | 15,329.91 | 5,109,971 $m^3/y$ |
| Abesim | Tano | Tano | 7,330.06 | 2,443,353 $m^3/y$ |
| Daboase | Pra | Pra | 29,880.36 | 9,960,120 $m^3/y$ |
| Inchaban | Anankwari | Pra | 19,973.10 | 6,657,700 $m^3/y$ |
| Kwanyako | Ayensu | Coastal | 14,931.77 | 4,977,257 $m^3/y$ |
| Winneba | Ayensu | Coastal | 2,488.72 | 829,572 $m^3/y$ |
| Koforidua | Densu | Densu | 4,966.92 | 1,655,640 $m^3/y$ |
| Hohoe | Dayi | Volta | 2,365.20 | 788,400 $m^3/y$ |
| Bolgatanga | Yaragantanga | White Volta | 8,100.00 | 2,700,000 $m^3/y$<br>450 ha (for irrigation) |
| Tamale | Nawuni | Volta | 21,407.16 | 7,135,721 $m^3/y$ |
| Vea | Vea | Volta | 816,000 | 2,400,000 $m^3/y$<br>1000 ha (for irrigation) |
| Tono | Tono | Volta | 3,760,286 | 2,500 ha<br>(for irrigation) |

*Source: Ministry of Water Resources, Works and Housing, 1998c; WRC, 2005*

*Groundwater Occurrence*

The occurrence of groundwater in Ghana is associated with 3 main geological formations (Figure 2.5). These are: i) the basement complex, comprising crystalline igneous and metamorphic rocks; ii) the consolidated sedimentary formations underlying the Volta Basin (including the limestone horizon); and iii) the Mesozoic and Cenozoic sedimentary rocks.

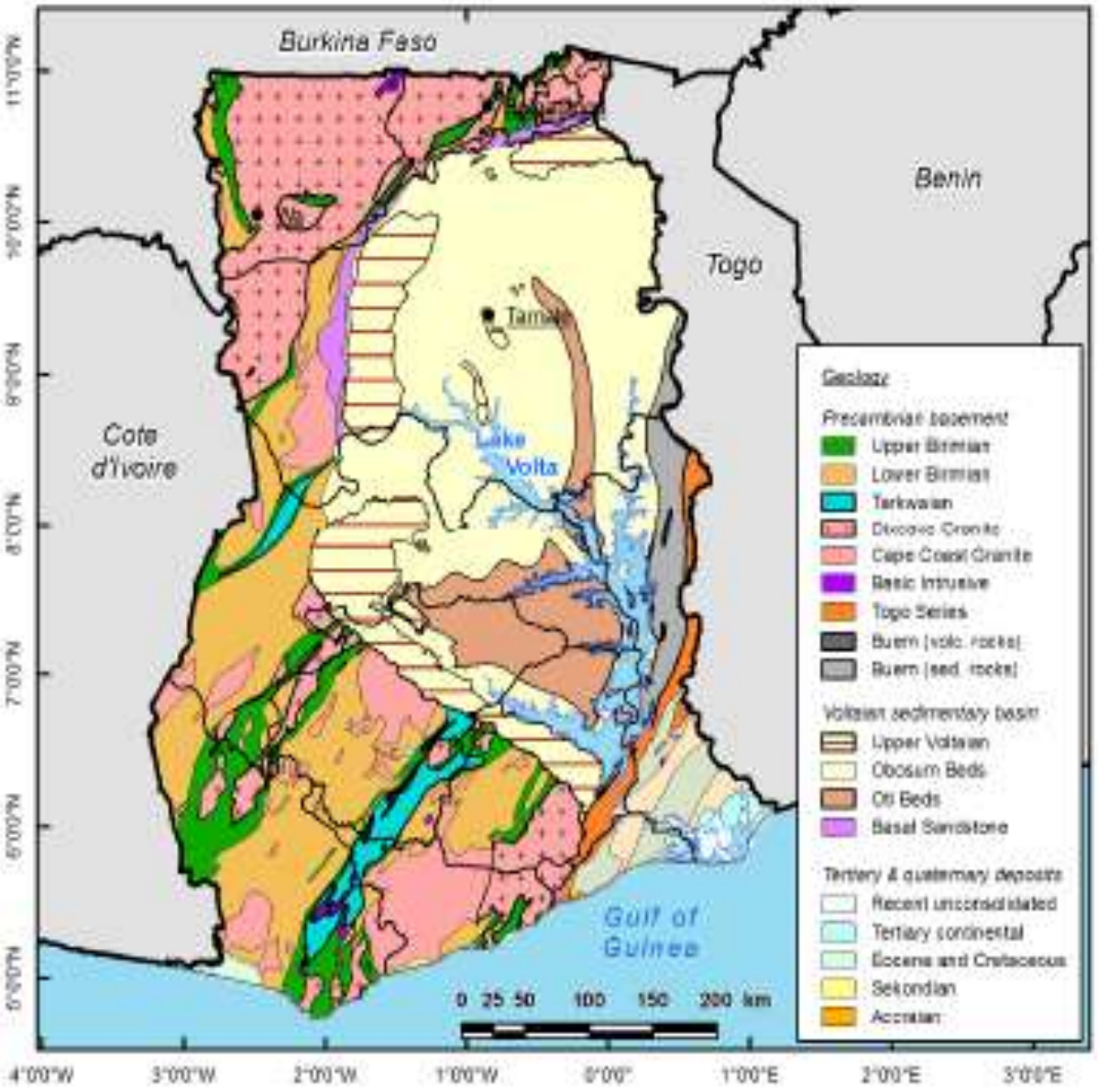



**Figure 2.5 Geological formations of Ghana**

The basement complex and the Voltaian formation cover 54% and 45% of the country respectively. These formations have little or no primary porosity and thus groundwater occurrence is associated with the development of secondary porosity resulting from jointing, shearing, fracturing and weathering. In the wet forested (south-western) part of the country, the weathered zone has an average thickness of 60 m while it is thinnest in the semi-arid area in the extreme northeast where the mean thickness is about 10m. The mean yield rarely exceeds $6m^3$/hr (GEF-Volta, 2002). The remaining 1% consists of Mesozoic and Cenozoic sediments, which occur mainly in the extreme south-eastern and western part of the country. Three aquifer types occur in this formation, consisting of a) an unconfined aquifer, which occurs in the *recent sand* very close to the coast. Its depth is between 2m and 4m and contains meteoric water; b) a semi-

confined to confined aquifer that occurs mainly in the red Continental Deposits of sand clay and gravel, with depths varying between 6 m to 120 m; and c) the third aquifer, which occurs in limestone and varies in depth between 120 and 300 m. Groundwater in this aquifer occurs under artesian conditions and is fresh. The average yield in this limestone aquifer is about 180$m^3$/hr.

Falling groundwater levels have been observed in the Northern Regions (Northern, Upper East and Upper West) where over 2,000 boreholes have been drilled since the mid-1970s in the rural areas to provide potable water to communities.

Groundwater resources development and management has been hampered by the limited data and information on the status of groundwater. WRC with the support of CIDA has implemented the "Hydrogeological Assessment Project" (HAP) in the three Northern Regions of Ghana. The HAP, which end in 2011, was aimed at improving the knowledge base and understanding of the hydrogeological conditions in those areas targeted increasing access to accurate groundwater resources information, and enhanced the technical and institutional capacity of institutions engaged in the collaborative management of groundwater resources.

*Raw Water Quality*

The quality of naturally occurring surface waters and groundwater resources in Ghana is generally good except for some cases of localized pollution arising out of practices such as the discharge of untreated waste material into water bodies from domestic and industrial activities, and illegal artisanal mining ('galamsey'). Discharges of untreated domestic and industrial water have caused serious water pollution in some urban and peri-urban locations. Rivers and lagoons located near industrial areas are dying as a result of the discharge of untreated industrial and domestic effluent leading to nutrient enrichment and odour (e.g. Korle Lagoon in Accra). High arsenic levels of between 40.5 to 1,290 mg/l have also been observed in the Pra and Tano Basins[2].

Cases of localised pollution and high levels of iron, fluoride and other minerals have been observed in groundwater resources as well. Drilling records of CWSA have revealed that on the average, about 20% of boreholes drilled for domestic water supplies have high concentrations of manganese, iron, or both metal compounds[3]. In the Eastern, Greater-Accra, Central, Northern, Ashanti, Volta and Western Regions, concentrations above the Ghana Standards Board permissible limits of 0 to 0.1 mg/1 (for manganese) and 0 to 0.3mg/1 (for iron) have been observed. In addition, low PH (water acidity) levels are associated with groundwater in most of the geological formations in these regions. In some mining communities, high levels of arsenic have been recorded in the groundwater (e.g. at Obuasi and Prestea), and high cyanide at Sumang in the Ankobra basin.

High concentrations of fluoride have also been observed in the Upper East, Upper West and Northern regions. Studies indicate that the proportion of groundwater sources (boreholes) with fluoride levels higher than 1.5mg/l (Ghana Standard Boards Permissible Limit) is in the range of 20 to 30%. High fluoride is known to cause significant health effects (e.g. tooth decay) through drinking water.

[2] *Country Environmental Profile of Ghana, October 2006*
[3] http://www.cwsagh.org/cwsa_subcat_linkdetails.cfm?prodcatID=4&tblNewsCatID=34&tblNewsID=10

The WRC, through the National Water Quality Monitoring Programme implemented under the WSSP–II (2004 to 2008), has prepared a Raw Water Quality Index (WQI) that is used to classify the health of rivers, streams, and lakes in a systematic manner. It guides WRC to categorise the quality of each section of a water body as good, fair, poor, or grossly polluted and also enables the comparison of the health of one river or section of a river with that of another.

## 2.5 Current and Projected Water demand

The natural endowment of renewable freshwater is currently about 53.2 BCM (billion cubic meters). A summary of water demand projections for 2000, 2010 and 2020 as well as the share of total water demand of each of the various water use sectors are shown in Table 2.6.

**Table 2.6 Water Demand Estimates**

| Demand | **Year** | | | **% of the total withdrawals** |
|---|---|---|---|---|
| | **2000 (Million $m^3$)** | **2010 (Million $m^3$)** | **2020 (Million $m^3$)** | |
| Total Demand for domestic/industrial* water | 487.24 | 755.45 | 937.00 | 1.76 |
| ▪ *Urban centres* | *320.64* | *523.55* | *616.00* | *1.18* |
| ▪ *Rural centres* | *166.60* | *231.90* | *321.00* | *0.58* |
| **Demand of other Sectors** | | | | |
| Irrigated agriculture | 617.45 | 2132.42 | 4114.42 | 5.46 |
| Livestock | 31.90 | 49.10 | 74.80 | 0.12 |
| Energy | 37,843 | 37,843 | 37,843 | 90.2 |
| Water Transport | N/A | N/A | N/A | |
| **Total Demand** | **38,979.59** | **40,779.79** | **42,969.22** | |
| **Renewable Freshwater resources**** | **53,200** | - | - | |
| Note: Demand for mining sector is not available yet | | | | |

*Source: Ministry of Water Resources, Works and Housing, 1998*

Currently, water abstractions are only a fraction (13%-19%) of the assessed potential for development, thus indicating an extremely low level of development. However, the uneven distribution of water resources in the country results in local shortages especially in the northern half and some urban centres.

## 2.6 Transboundary Water Resources

Ghana shares the bulk of her water resources with neighbouring countries (Benin, Burkina Faso, Côte d'Ivoire, Mali and Togo), and in the case of the Volta River it is the most downstream country, making the judicious joint management of the resources of paramount importance to Ghana (Figure 2.6).

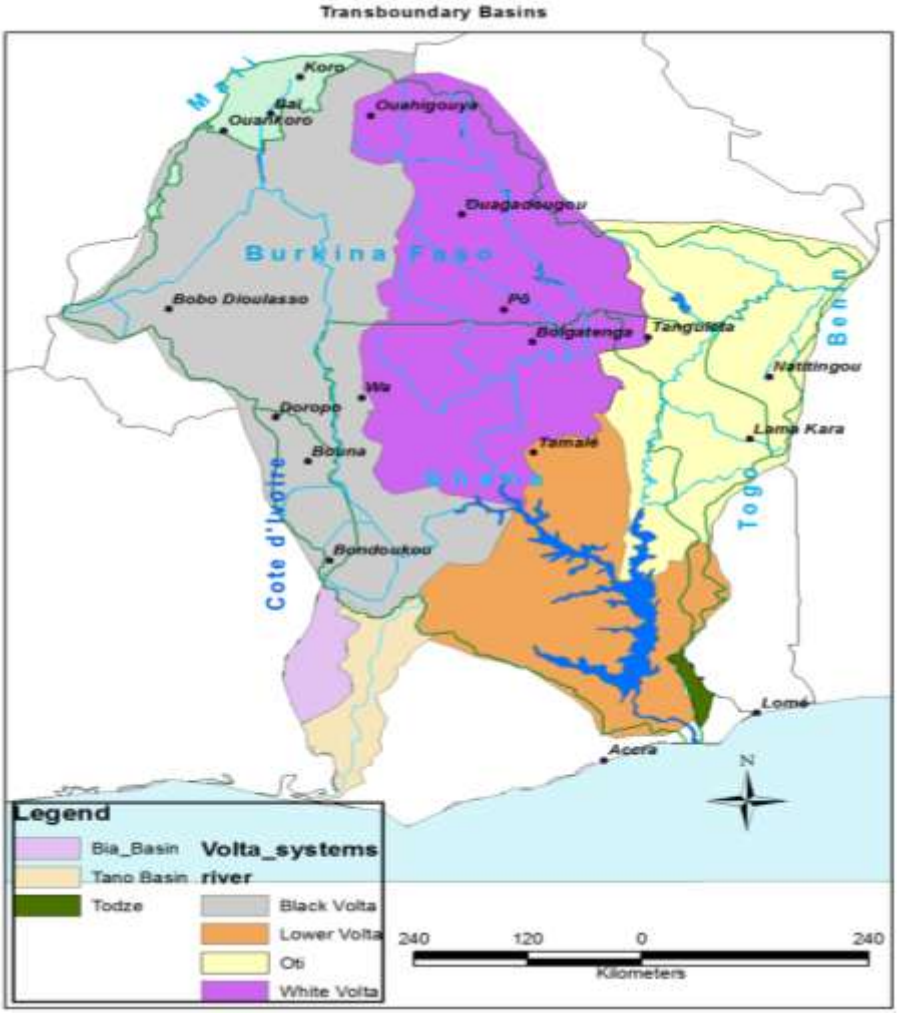



**Figure 2.6 Transboundary River Basins**

The Volta Basin System is composed of the Black Volta (147,000 $km^2$), White Volta (106,000 $km^2$), and the Oti (72,000 $km^2$).

About 22.9 $km^3$ of surface water enter the country annually, of which 8.7 $km^3$ come from Burkina Faso (Black Volta contributing about 5 $km^3$, while that of the White Volta is about 3.7 $km^3$/yr), 6.2 $km^3$ from Côte d'Ivoire and 8 $km^3$ from Togo. This amount constitutes 43% of the estimated global water resources of Ghana (53.2 $km^3$). Thus, Ghana is to a large degree depending on collaboration with its neighbour countries on sharing its water resources potential.

On the south-western border, the coastal-lagoon and river system (Aby-Bia-Tano) is shared with Côte d'Ivoire. Most of the lagoon system is located in Côte d'Ivoire but the larger part of the two river basins (Bia and Tano) is located in Ghana and drains a region of intensive gold mining activities. The Bia takes its source in Ghana and flows southwest to Côte d'Ivoire, draining finally into the Aby lagoon. Its total area of 10,200 $km^2$ is split between Ghana (69%) and Côte d'Ivoire (31%). The Tano River takes its source from the Boyem mountain range, some 4 km from Techiman in the Brong Ahafo Region at an altitude of 518 meters above sea level. Its total catchment area of around 15,000 $km^2$ is split between Côte d'Ivoire (7%) and Ghana (93%). The last 100 km of the downstream part of the Tano River make the border between Côte d'Ivoire and Ghana, before the river reaches the Aby-Tendo-Ehy lagoon system in Côte d'Ivoire.

**Table 2.7 Trans-boundary basins in Ghana.**

| River basin | Area in Ghana ($km^2$) | Percent in Ghana (%) | Area outside Ghana ($km^2$) | Total area ($km^2$) |
|---|---|---|---|---|
| **Volta River System** | **176,751** | **43.1** | **233,054** | **409,805** |
| Black Volta | 35,107 | 23.6 | 113,908 | 149,015 |
| White Volta | 45,804 | 43.7 | 58,945 | 104,749 |
| Oti | 16,213 | 22.3 | 56,565 | 72,778 |
| Lower Volta | 68,588 | 95.4 | 32,730 | 71,861 |
| Tordzie Aka | 1,865 | 83.7 | 363 | 2,228 |
| **South western system** | **52,862** | **96.9** | **1,718** | **54,580** |
| Bia | 7,000 | 68.7 | 3,200 | 10,200 |
| Tano | 14,877 | 92.7 | 1,184 | 16,061 |

*Source: Water Resources Commission, 2010*

# CHAPTER 3 THE LEGAL AND INSTITUTIONAL SITUATION

## 3.1 The Enabling Environment for the Water Sector in Ghana.

*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 essential documents: i.e. the WRC Act 522 of 1996 and the National Water Policy (NWP) of 2007.

The WRC Act clearly defines the WRC as the overall responsible body for water resources management in Ghana and is specifically mandated to:

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

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

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

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

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

- ***Water Abstraction, Diversion and Damming:*** This is under the Water Use Regulations 2001 (L.I. 1692) and provides procedures for allocating permits for various water uses including domestic, commercial, municipal, industrial, agricultural, power generation, water transportation, fisheries (aquaculture), environmental, recreational and under water wood harvesting. In 2006 the Drillers License and Groundwater Development Regulations were promulgated.
- ***Drinking Water Tariffs and Efficiency:*** The Public Utilities Regulatory Commission (PURC) Act 538 of 1997 set up the PURC and conferred on it the mandate to regulate standards of utility services including the tariffs set by the Ghana Water Company Limited (GWCL) for urban water supply, the quality of drinking water provided by the company, ensure proper water industry practices, and protect the interests of consumers.
- ***Drinking Water Quality Standards:*** The Ghana Standards Board (GSB) issues Drinking Water Quality Standards and sampling procedures covering the quality of water supplied by public water utilities.
- ***Effluents and Waste Discharges:*** The WRC and the Environmental Protection Agency (EPA) control the pollution and effluent discharges into water bodies. EPA, through its Environmental Assessment Regulations of 1999 (L.I. 1652) defines procedures for acquiring environmental permits and conducting Environmental Impacts Assessments (EIA) for development projects that have or are likely to have adverse effects on the environment including water resources.

*International Agreements*

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

- United Nations Convention on the Law of the Sea, *7 June 1983*
- Convention on Wetlands of International Importance Especially as Waterfowl Habitats: Ramsar Convention, *22 February 1988*
- Convention on Biological Diversity, *29 August 1994*
- United Nations Framework Convention on Climate Change, *6 September 1995*
- United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, *27 December 1996*
- The Ouagadougou Ministerial Statement on IWRM *March 1998*
- Ghana–Burkina Faso Joint Declaration on improved management of the natural resources of the Volta Basin, *April 2004*
- Resolution for the establishment of a Volta Basin Technical Committee, *July 2004*
- Convention setting up the Volta Basin Authority, *August 2009*.

While Ghana is yet to ratify the UN Convention on the Law of Non-Navigational Uses of International Watercourses (May, 1997)[4], most of the IWRM principles in the NWP draw on the articles of the Convention.

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

### 3.2 Institutional roles and coordination of the water sector

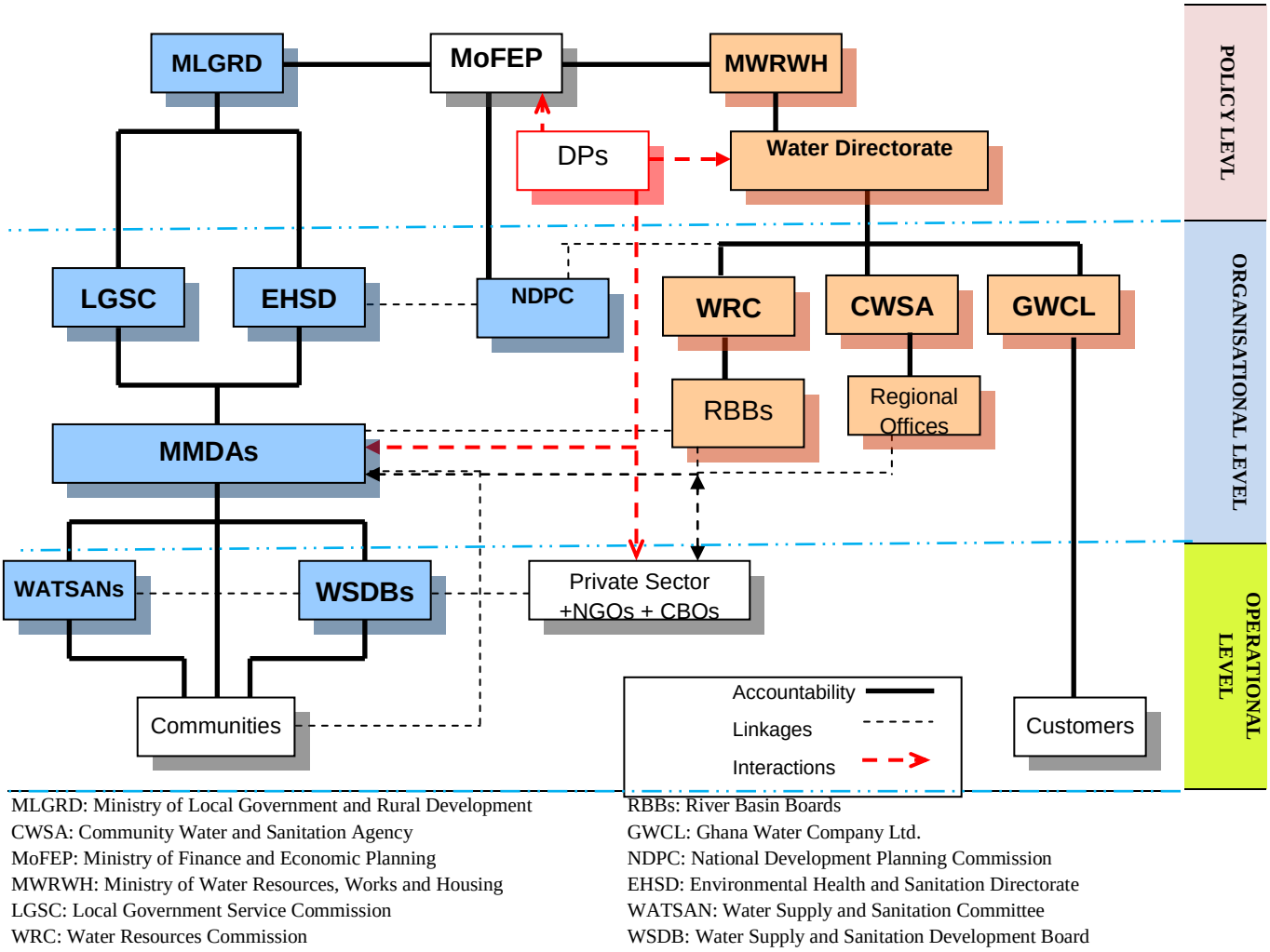
As mentioned earlier, the NWP outlines the overall policy framework for the water sector and it covers the key areas of water resources management, urban water supply, and rural water supply and sanitation. The various institutions and stakeholders in the WSS-sector operate at three functional levels, namely Policy, Organisational and Operational as illustrated in Figure 8.

At the Policy/Strategic level, three core ministries (MWRWH, MLGRD, and MoFEP) and the development partners (DPs) collaborate to ensure the delivery of water and sanitation 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)[5] for the water sector. The WD is as well facilitating the linkages with the other 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 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 SWAp mechanism.

[4]Available at http://untreaty.un.org/ilc/texts/instruments/english/conventions/8_3_1977.pdf

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




MLGRD: Ministry of Local Government and Rural Development
CWSA: Community Water and Sanitation Agency
MoFEP: Ministry of Finance and Economic Planning
MWRWH: Ministry of Water Resources, Works and Housing
LGSC: Local Government Service Commission
WRC: Water Resources Commission
RBBs: River Basin Boards
GWCL: Ghana Water Company Ltd.
NDPC: National Development Planning Commission
EHSD: Environmental Health and Sanitation Directorate
WATSAN: Water Supply and Sanitation Committee
WSDB: Water Supply and Sanitation Development Board

*Source: Adapted from PEM Consult: MWRWH, 2005*

**Figure 3.1 Functional Chart of Water and Sanitation Institutions**

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 (see Figure 3.1) 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 (GWCL), Hydrological Services Department (HSD), Volta River Authority (VRA), Water Research Institute of the Council for Scientific and Industrial Research (WRI/CSIR), Ghana Meteorological Agency (GMet), Environmental Protection Agency (EPA), Ghana Irrigation Development Authority (GIDA), Forestry Commission (FC), and Minerals Commission (MC). Also represented are Women, NGOs and Traditional Authorities (Chiefs). The WRC performs its duties through its River Basin Offices (RBBs), and collaborating and coordinating with District Assemblies and institutions represented on the Commission. It approves projects involving appropriation, utilization, exploitation, development, control, conservation and protection of Ghana's water resources.

The National Development Planning Commission (NDPC) is the central economic planning authority in Ghana responsible for the preparation of national development plans. It coordinates the development plans of all MMDAs in Ghana. NDPC provide the platform to integrating water sector development plans into the national development policy framework (Ghana Shared Growth and Development Agenda).

At the Operational (or decentralised administration) level, MMDAs, RBBs, NGOs/CBOs and other civil society groupings, working together within a river basin focused framework, are engaged to take charge and coordinate water resource management and sanitation activities as far as feasible following the principle of "management at lowest appropriate level". The MMDAs are responsible for planning and development in line with guidelines issued by the NDPC through the Local Government Service Commission (LGSC). The sub-district government structure (Area Council and Unit Committee) provides the avenues for local- participation in the planning and priority setting process. Specific to WSS, the MMDAs perform the following functions;

i) Take investment decisions for the infrastructure required for drinking water supply (bore holes) and to some extent for irrigation (small dams, dugouts). These have to be part of the District Development Plans. The situation demands close coordination with the line agencies in charge (CWSA and MOFA), as well as the funding agencies.

ii) Provide the needed management support to the local communities in managing the infrastructure for domestic water supply and for irrigation systems. In the case of domestic water supply, (WATSANs) and WSDBs have been established (within the Assemblies) to assist communities in the management of rural and small-town point-source supplies respectively. As part of their functions WATSANs process the applications of communities for boreholes, and supervise the work of the consultants who are contracted to conduct community training.

In the case of water for agriculture, the administrative staffs at the District Offices of MOFA provide technical support through the implementation of projects and beyond. This, notwithstanding the provision of guidance for important aspects of the management of the small

reservoirs, is done by the MMDAs. They also mediate in conflicts regarding land use related to small dams.

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 sub-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.

The WATSAN approach fits well into the decentralisation policy and into the policy of implementing a demand-driven community-based rural drinking water supply, which is one of the principles of IWRM. The committees or sub-committees in charge of agriculture and domestic water supply at the MMDAs could serve as good avenues for discussing the demands of community members.

In addition to the above mentioned institutions, the following three technical entities play a major role in gathering data and information for water resources management:

GMet provides meteorological services in the country and ensures the operation and maintenance of standards and practices in meteorology in the country. GMet has 22 synoptic stations, 132 climate sub-stations (of which 116 are operational), and 300 rainfall stations.

HSD provides engineering services for the Government of Ghana in the areas of hydrology and water resources engineering. It has been collecting data since the 1950s through 156 collection stations of different ages. Today it provides water height records and river discharges measured at 70 stations. Moreover, it digitalises data and maintains all hydrological data in a central databank.

WRI-CSIR is one of the 13 institutions of the CSIR. It was established in 1996 from the merger of the erstwhile Institute of Aquatic Biology and the Water Resources Research Institute, all of the CSIR. The 2 Institutes were established earlier in 1965 and 1966 respectively. The institute conducts research into water and related resources through the generation and provision of scientific information, strategies and services towards the development, utilisation and management of water resources of Ghana. It also provides training in a number of specialised areas of water resources management.

*Traditional Institutions and Water Rights*

In Ghana, customary water rights are often rooted in customary *land* law, i.e., the body of rules and practices that govern access to and tenure of land. It implies that a customary grant of land generally confers rights on water resources. Hence, customary water rights in Ghana were regarded as part of land rights until the enactment of the Water Resources Commission Act of 1996. At the basin level, governance structures based on customary law and those based on modern law coexist. In the local government system, the traditional authorities have no formal representation at the District and sub-district levels. They are, however, known to play important roles in managing land and other natural resources at the sub-district levels.

Though formal law acknowledges the role of the traditional authorities in land management, their role in the management of water resources is not explicitly stated. In fact in the light of the WRC Act 522 of 1996 their claim to ownership of the water bodies is non-existent because these are vested in the President to hold it in trust for and on behalf of the people of Ghana. Chiefs are however represented on the Commission of WRC as well as on the RBBs.

# CHAPTER 4 THE WATER RESOURCES ISSUES

Though Ghana is well endowed with significant freshwater resources, the resources are at risk of depletion and degradation because of:-

- *Uncontrolled catchment degradation* due to poor agricultural practices (especially farming along river banks), population pressure (forest excision for resettlement and industrialisation), deforestation (for agricultural land and fuel wood) and surface mining, which invariably affect surface water availability as well as quality.
- *Pressure due to Climate Change and Climate Variability*, which makes the natural flow of water in the river channels highly variable. Fresh water regimes have been modified resulting in shrinking of the resources, and affecting water supply and river transport. Major recent floods that affected most communities, especially northern part of Ghana occurred in 2007, 2008 and 2010. Major drought periods have been recorded every 7-10 years with the severest occurring in 1981-1985 and 1998-2000.
- *Increasing population growth and urbanisation* has also set a heavy demand on land, water and other natural resources and induces conflicting and competing water uses and pollution.

Following from the technical assessments and description of the water resource-related challenges as presented in the previous chapters, a consultative process was carried out to involve major stakeholders with the aim of capturing their knowledge on water resources problems and actions required in addressing the identified water management issues and problems.

In Ghana, well established procedures exist where plans and programmes are elaborated and vetted following a participatory approach allowing for thorough public discussions - often in workshop settings, and guided by principles that form part of the concept of Strategic Environmental Assessment (SEA). The SEA approach for planning is defined as:

"*A systematic process of evaluating the environmental effects of a policy, plan or programme and its alternatives, including documentation of findings to be used in publicly accountable decision-making".*

Furthermore, the application of SEA procedures in IWRM planning means that the evaluation of environmental effects has an additional social dimension, viz.:

*"…to safeguard the future sustainable use of water resources aimed at maintaining the economic and social welfare within a basin without compromising the preservation of vital aquatic ecosystems".*

In adherence with the SEA principles of embracing a participatory approach, stakeholders with specific interest/knowledge of water resources management, including planners from District

Assemblies, governmental departments, representatives from major water users, and NGOs were gathered in workshops to identify and discuss major water resources issues.

Through the SEA process the stakeholders identified a) Increase availability of water resources; b) Catchment protection; c) Conservation of water quality; d) Adaptation to climate variability and change; and e) Institutional strengthening, as the most important overall issues for managing Ghana's water resources. Based on analyses of root causes and environmental sustainability tests the SEA workshops resulted in the following list of measures and actions within the five issue areas identified:

*Increase availability of water resources*

- Promote rainwater harvesting
- Develop climate resilient techniques in the development of water resources
- Promote efficient use of water resources

*Improve catchment protection*

- Create awareness and sensitise stakeholders about negative impacts of land degradation.
- Provide incentives to change behaviour and alternatives to lost livelihoods.
- Implement buffer zone policy.
- Enforce compliance with regulations
- Develop information and databases on water resources, ecosystems, socio-culture, economics, etc
- Promote Monitoring and evaluation of IWRM activities

*Conserve water quality*

- Enforce regulations on waste management and pollution control of surface and ground water resources;
- Review the Water Quality Index
- Enforce laws on illegal mining activities;
- Implement polluter pays principle and recover costs (wastewater regulations)

*Adapt to climate variability and change*

- Monitor climate elements and create early warning systems;
- Promote ADAPTS concept (community to national level / bottom up) approach to adapting to climate change.
- Develop scenarios for extreme water availability, their impacts and develop corresponding strategies to adapt and cope for sustainable livelihood use of water.

*Strengthen institutional capacity*

- Intensify education and training at all levels;
- Set up inter-sectoral collaboration and co-ordination committees at Basin and National levels;
- Provide logistics for monitoring and enforcement of regulations.

The SEA process was complemented by expert consultations on the more specific technical issues that should be targeted for the future water resources management. For prioritisation of these, the "Water Resources Issues Assessment Method" (WRIAM) was used. The WRIAM method gives scores (0-5) of relative importance to each water resources issue defined as a water resources problem with its underlying immediate cause (the latter indicating the target of management action). It distinguishes between "impact issues" i.e. effects of human activities on the water availability or the quality (for groundwater or surface water) and the "user requirement" issues defined by possible mismatch between quantity demands or quality requirements for specific uses. The scoring system takes into account both the geographical extend and the severity of the problem. The SEA outcomes, the WRIAM prioritization, and the final corresponding action programme (see Section 5 and 6) were all validated by the stakeholders at a final workshop in November 2011.

The prioritised issues and their individual scores of priority according to WRIAM procedure are shown in schematic form below.

**Water resources issues - Groundwater**

***1 Impact on groundwater availability***

| Nature of impact | Cause | Score |
|---|---|---|
| Reduced availability | Long term climate changes | 5 |
| Perturbation of infiltration | Deforestation/land degradation | 4 |
| Perturbation of infiltration | Urbanisation | 4 |
| Reduced availability | Short term variability of precipitation | 2 |
| Reduced availability | Abstraction for urban water supply | 1 |
| Reduced availability | Abstraction for industries | 1 |

***2 Impact on groundwater quality***

| Nature of impact | Cause | Score |
|---|---|---|
| Pathogenic pollution | Domestic wastewater | 1* |
| Organic pollution | Domestic, livestock, industry, aquaculture | 1 |
| Pesticide pollution | Agriculture, livestock, combat of disease vectors | 1 |
| Other chemical pollution | Mines, industry, energy/transport, solid wastes | 1 |

*Slight problem in view of the general "resources" quality – but is often an important problem in view of contamination local water "sources".

***3 Match between needs and groundwater availability***

| Nature of issue | Sectoral demand | Score |
|---|---|---|
| Insufficient groundwater resource* | Rural water supply demand | 1 (technical issue) |

*Needs more research

***4 Match between water quality requirements and groundwater quality***

| Nature of issue | Sectoral requirement | Score |
|---|---|---|
| Insufficient groundwater quality | Requirement for urban water supply (drinking water quality) | 1 |
| Insufficient groundwater quality | Requirement for rural water supply (drinking water quality) Iron, fluoride, salinisation | 1-2 |

**Water resources issues – Surface water**

***1 Impact on surface water availability***

| Nature of impact | Cause | Score |
|---|---|---|
| Reduced availability | Long term climate change | 5 |
| Perturbation of runoff | Urbanisation | 5 |
| Perturbation of runoff | Deforestation/land degradation | 4 |
| Perturbation of runoff | Infrastructures | 4 |
| Reduced availability | Short term variability of precipitation | 4 |
| Reduced availability | Impact from upstream dams | 3 |
| Water loss | Excessive evaporation | 3 |
| Reduced availability | Abstraction from irrigation | 1 |
| Water loss | Sedimentation of reservoirs | 1 |

***2 Impact on surface water quality***

| Nature of impact | Cause | Score |
|---|---|---|
| Pathogenic contamination | Domestic waste water | 4 |
| Chemical pollution | Drainage from mines | 4 |
| Turbidity | Erosion/land degradation | 4 |
| Organic pollution | Urban waste and waste water | 2 |
| Eutrophication | Agricultural cropping, domestic waste water and erosion | 2 |
| Chemical pollution | Industries | 2 |
| Chemical pollution | Urban waste | 2 |
| Organic pollution | Livestock | 1 |
| Organic pollution | Food industries | 1 |
| Pesticide pollution | Agricultural cropping | 1 |
| Chemical pollution | Energy/transport | 1 |

***3 Match between needs and surface water availability***

| Nature of issue | Sectoral demand | Score |
|---|---|---|
| Insufficient water availability | Demand for urban water supply | 1 |
| Insufficient water availability | Demand for rural water supply | 1 |
| Insufficient water availability | Demand for irrigation | 1 |
| Insufficient water availability | Demand for hydropower | 1 |
| Insufficient water availability | Demand for ecosystems | 1 |
| Insufficient water availability | Demand for neighbouring countries | 1 |

***4 Match between water quality requirements and surface water quality***

| Nature of issue | Sectoral requirement | Score |
|---|---|---|
| Insufficient surface water quality | Urban water supply (drinking water) | 4 |
| Insufficient surface water quality | Rural water supply (drinking water) | 2 |
| Insufficient surface water quality | Ecosystem requirements | 1 |

**Water resources issues – Risks to human life and economic development**

***1 Impact on human livelihood and societal economy***

| Nature of impact | Cause | Score |
|---|---|---|
| Loss of land fertility | Soil erosion/intensive precipitation/floods | 5 |
| Loss of crops | Floods | 5 |
| Damage of infrastructure/ housing/ lives | Floods | 5 |
| Accidents/dam breaks etc. | Physical structures | 4(potential) |
| Increase of water borne diseases | Physical structures | 4 |
| Water shortage/reduction of crops | Droughts | 3 |

# CHAPTER 5 THE OPPORTUNITIES AND THE CHALLENGES

The current water resources management situation in Ghana can be characterised by a number of opportunities and challenges with respect to solving the prioritised primary issues.

*Opportunities*

Water Resources Management in Ghana is based on a long term commitment to IWRM starting even before the adoption of the Ouagadougou Ministerial Statement on IWRM in 1998 by the ECOWAS countries. Since then Ghana has developed its IWRM framework along the lines of international recognised IWRM principles. The current opportunities/achievements with respect to the implementation of IWRM are as follows:

- Water sector development planning framework including IWRM is close to adoption
- There is consensus on IWRM approach among GoG and all other sector stakeholders;
- IWRM principles are embedded in water policy and national water law
- Regulations within key aspects of WRM such as Water Use Regulations (2001) and Drillers License and Groundwater Development Regulations (2006) are in place
- The institutional framework covers mandates for most water resources management functions
- The operational Water Resources Commission currently provides oversight responsibility for managing the country's water resources with cross-sectoral coordination;
- River basin management boards and offices have been established in some basins and are scheduled to be created in more basins;
- Ghana is an active party to the trans-boundary agency (VBA) for the Volta Basin;

*Challenges*

The main challenges or constraints to address for improving the implementation of IWRM are:

- Inadequate enforcement of existing regulations and permit conditions
- In adequate regulations on control of discharge of effluent from industrial and domestic sources
- Inadequate data and information on surface and groundwater quantity as well as water quality

- Climate change and climate variability impacts on water and other natural resources are inadequately described and insufficiently incorporated in sectoral water management strategies
- Many activities in river basins leading to catchment degradation and poor water quality are unregulated (e.g. buffer zone policy is not implemented)
- Systems for early warning and mitigation of effects from floods and droughts are inadequate;
- New protocols with Côte d'Ivoire on the joint management of the (Aby Lagoon-Bia-Tano) basins system and with Togo on shared groundwater resources are yet to be established
- There is inadequate skilled human resources for IWRM at all levels

# CHAPTER 6 THE IWRM ACTION PROGRAMME

## 6.1 Introduction

The framework of the National IWRM Plan is developed based on actions consistent with the key thematic pillars of IWRM, i.e.:

a) *Enabling environment* – policies, legislation, financing;

b) *Institutional roles*- organisational framework and institutional capacity building; and

c) *Management instruments*- technical tools for IWRM, efficiency in water use, regulatory instruments, water resources monitoring and information exchange.

The IWRM Action Programme outlines the objectives and actions that address the key IWRM challenges (Chapter 5).

## 6.2 Policy Objectives for the IWRM Action Programme

Six overarching policy objectives have been identified for the action programme:

- Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change
- Enhance public awareness and education in water resource management issues
- Improve access to water resources knowledge base to facilitate water resources planning and decision making
- Improve trans-boundary and international cooperation in the management of shared water resources
- Ensure gender equity in water resources management and planning
- Develop and operationalise a national M&E system to track progress in IWRM implementation

Ten strategic outcomes were identified to support these policy objectives and each outcome is supported by actions that the WRC will lead in the implementation in collaboration with partners, and are consistent with key principles that provide the basis for the national water policy and consistent with the Water Sector Strategic Development Plan.

## 6.3 Actions

In the following tables the action programme is presented structured under the policy objectives and the strategic outcomes. The institutions involved in implementing the action are indicated in the right column. For each action, a more detailed action sheet is given in Annex B.

**1 Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change**

*1.1 Enhance the policy framework for IWRM*

| | |
|---|---|
| 1.1.1 Review the IWRM component of the National Water Policy to address emerging challenges and clarify mandates and roles among stakeholders | **WRC** + WD/MWRWH |

*1.2 Enhance the implementation of existing regulations on WRM*

| | |
|---|---|
| 1.2.1 Assess and review existing water use- and the drilling license and groundwater development regulations | **WRC** + WD/WRI/CWSA/ EPA/AGD |
| 1.2.2 Provide capacity building support to AGD and Security services to enforce regulations and permit conditions on raw water | **WRC +** EPA/AGD |

*1.3 Develop and implement additional regulations on Dam Safety and Effluent discharges*

| | |
|---|---|
| 1.3.1 Establishment of a Dam Safety Unit | **WRC** + WD/VRA/GIDA/ EPA/GWCL/MMDAs |
| 1.3.2 Develop guidelines and regulations for dam safety (including operating rules for floods and evacuation plans) | **WRC** + WD/VRA/GIDA/MJ-AGD/ EPA/GWCL/MMDAs/NADMO/GMet |
| 1.3.3 Develop regulations for waste water/effluent discharges | **WRC** + WD/GIDA/ EPA/GWCL/MMDAs |
| 1.3.4 Develop procedures and operational mechanisms for enforcement of regulations on waste management and pollution control | **WRC + EPA/**MMDAs/AGD/ GP(police) |

*1.4 Ensure the protection and conservation of river basins and wetlands for water security as well as enhance resilience and adaptation to climate change*

| | |
|---|---|
| 1.4.1 Prepare and update national and river basins IWRM plans | **WRC** + WD/EPA/MMDAs/RBBs/NGOs |
| 1.4.2 Establish River Basin Offices and Boards with adequate office accommodation and logistics | **WRC** + WD + |
| 1.4.3 Implement the buffer zone policy for protection and restoration of rivers, water bodies, and wetlands | **WRC** + WD/EPA/MMDAs/RBBs/NGOs |
| 1.4.4 Formulate legal instruments for buffer zone policy | **WRC** + WD/MJ-AGD/ EPA/ MMDAs/RBBs/NGOs |
| 1.4.5 Develop and implement strategic policy framework for rainwater harvesting | **WRC** + WD/EPA/MMDAs/RBBs/NGOs |
| 1.4.6 Incorporate climate change adaptation to water conservation strategies | **WRC** +WD/EPA/MMDAs/RBBs/NGOs/NADMO |
| 1.4.7 Promote ADAPTS concept to climate change adaptation.(The ADAPTS approach to climate change is a bottom – up approach and builds on the needs, priorities and actions of local people and their communities and ensures that adaptation considerations are effectively incorporated into water policies, plans and investment strategies | **WRC +** EPA/NGOs/RESEARCH INSTITUTIONS/RBBs |

**2 Enhance public awareness and education in water resource management issues**

*2.1 Strengthen communication campaigns and education to stimulate interest and promote support for WRM-related initiatives*

| | |
|---|---|
| 2.1.1 Review and implement IWRM communication strategy (including messages and materials) for increased public awareness and education of IWRM. | **WRC** + WD/CWSA/VRA/EPA/GWCL/MMDAs/NGOs |
| 2.1.2 Collate best practices on IWRM and disseminate 'lessons learned' at local, national and international levels | **WRC** + WD/CWSA/VRA/EPA/ GWCL/MMDAs/NGOs |
| 2.1.3 Intensify education and training in IWRM at all levels. | **WRC**+ WD/CWSA/VRA/EPA/ GWCL/MMDAs/NGOs/NADMO/ CBOs |

**3 Improve access to water resources knowledge base to facilitate water resources planning and decision making**

*3.1 Improve data and information management*

| | |
|---|---|
| 3.1.1 Support the set-up, rehabilitation, and upgrade the hydro-meteorological monitoring networks as well as introduce new technologies for data collection and analysis. | **WRC, HSD/GMet/WRI** + MWRWH/ MMDA/NNRI |
| 3.1.2 Implement the "Groundwater Management strategy" nationwide to increase access to accurate groundwater resources information | **WRC, WRI +** MWRWH/MMDA/NNRI |
| 3.1.3 Strengthen water quality monitoring and data assessment including ecological/biological monitoring and further development of water quality guidelines and criteria. | **WRC** + EPA/WRI/GWCL/ CWSA/NNRI |
| 3.1.4 Monitor Climate Elements and Create Early Warning Systems; | **WRC + GMet/HSD/WRI/EPA/ NADMO** |
| 3.1.5 Strengthen human and technical capacities of institutions for data analysis and archiving including GIS-Driven Data and Information Databases on water related information (incl. also ecosystems, Socio-Culture, Economics) and models for analysis and Decision Making. | **WRC/MWRWH/GMet/WRI** + MMDA/NNRI |

*3.2 Promote scientific investigations and research in water resources assessment, management and development.*

| | |
|---|---|
| 3.2.1 Develop decision support models to assess and manage impacts on quality and quantity of water resources | **WRC/GMet/WRI/HSD+**WD/ MMDA |
| 3.2.2 Promote further hydrogeological investigations nationwide | **WRC/GMet/WRI/GAEC +** WD/MMDA |
| 3.2.3 Establish national forecasts for climate change based on global and regional models | **WRC/EPA +** WRI/GMet/Universities |
| 3.2.4 Carry out research on strategies for adaptation to climate change | **WRC/EPA +**GMet/universities/etc |

**4 Improve trans-boundary and international cooperation in the management of shared water resources**

*4.1 Facilitate the development of bilateral and multilateral agreements/protocols to strengthen cooperation with riparian countries in shared basins*

| | |
|---|---|
| 4.1.1 Initiate and adopt new protocols with Côte d'Ivoire on the joint management of the (Aby Lagoon-Bia-Tano) basins system and with Togo on shared groundwater resources | **WRCMWRWH** +/MFA-RI/MJ-AGD/VRA/MMDAs |
| 4.1.2 Facilitate the county's financial contribution, participation and implementation in international programmes and plans (e. g. ECOWAS,VBA, GEF-Volta, GWP/WA and AMCOW) | **WRC/MWRWH**+ WD/MoFEP/MFA-RI/MJ-AGD/MMDAs |

**5 Ensure gender equity in water resources management and planning**

*5.1 Ensure gender equity in water resources management*

| | |
|---|---|
| 5.1.1 Implement the Gender and Water Resources Management Strategy | **WRC**+ WD, EPA, MMDA, NGOs, CBOs |

**6 Develop and operationalise a national M&E system to track progress in IWRM implementation**

*6.1 Set-up a national M&E system for the implementation of IWRM*

| | |
|---|---|
| 6.1.1 Develop indicators | **WRC** |
| 6.1.2 Identify and implement mechanisms for monitoring and evaluation | **WRC** |

# CHAPTER 7 MECHANISM FOR IMPLEMENTATION

## 7.1 Organisational Management:

Water resources management issues are cross cutting, and to achieve the planned outcomes will require a concerted effort to influence other sectors. The responsibilities of the implementing entities are indicated in the summary table in Chapter 6 and in the action sheets (Annex B)

The implementation of the plan will be done using existing structures and institutions as much as possible. WRC has already developed a high level of collaboration with agencies and stakeholders, which will be maintained and further strengthened. Cooperation and delegation of responsibilities will take place rather than creation of new organisational units.

In broad terms, policy and overall oversight and coordination is provided by the Water Directorate, while the Water Resources Commission carries out the practical implementation of IWRM with the assistance of other stakeholders.

The WD is leading the process of institutionalizing the sector-wide approach (SWAp) towards the coordination of policies, plans and programmes in the water sector. The approach would strengthen linkages between sector programmes and the IWRM Plan, budgeting and evaluation processes at all levels. The DPs will also be given a participatory role in the orientation of policies and in monitoring the impact of the SWAp.

The WRC is composed of the major water-related regulators, data management institutions, and water users and thus provides a forum for integration and balancing of different interests. Membership of WRC includes, i) organisations involved mainly in data collection and analysis (HSD, WRI, and GMet); ii) organizations involved mainly in the development and use of the water resources, including hydropower production and irrigation (i.e. GIDA, GWCL, CWSA, and VRA); iii) organizations involved primarily in the regulation of the environment and natural resources (EPA, FC and MC), and iv) other interest groups (specifically NGOs, traditional authorities and women) which take care of civil society interests and play advocacy roles.

At the decentralised level, MMDAs, NGOs/Community Based Organisations (CBOs) and other civil society groupings that work together within a river basin are engaged to take charge and coordinate water resources management activities as far as feasible following the principle of "management at lowest appropriate level". This is done through the RBBs as the water resources management structure for each major river basin in the country. The first RBB and its secretariat i.e. the Densu Basin Office started operations in 2003, the White Volta Basin Office in 2004 and the Ankobra in 2007. WRC established three more basin secretariats (Dayi, Pra and Tano) in 2011 and 2012.

# CHAPTER 8 MONITORING AND EVALUATION

Monitoring and evaluation (M&E) are key elements in the implementation of the IWRM Plan. Through M&E, progress towards goals and objectives can be tracked and lessons captured to improve performance.

Operational and progress indicators (Output Indicators) shall be identified as part of the plan implementation (see Action 6.1.1 of the Action Programme). However a general M&E for the action program has been developed to track progress of the plan (See Table 8.1)

The major internal progress monitoring tools proposed are the quarterly progress reports and annual sector performance reports to be compiled by the WD and the WRC secretariat and presented at the regular sector working group meetings. Annual review meetings will be organised and the participants will be drawn from key sector institutions, Development Partners, collaborating Partner Ministries, and District and Local Government representatives.

The Plan will be evaluated as part of the evaluation system of the Water Sector Strategic Development Plan. Action 6.1.2 of the Action Programme concerns the development and implementation of monitoring and evaluation of IWRM Plan.

**Table 8.1 M&E for the action program**

| **Objectives** | **Strategic targets** | **Key Indicators** | **Duration** |
|---|---|---|---|
| 1 Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change | *1.1 Enhance the policy framework for IWRM* | ▪ National Water Policy reviewed by 2013<br>▪ Reviewed National Water Policy receive cabinet approval by end of 2013 | |
| | *1.2 Enhance the implementation of existing regulations on WRM* | ▪ Updated versions LI1692 and LI 1827 completed and adopted by 2013<br>▪ Number of prosecutors/law enforcement personnel trained by 2014<br>▪ Number of training organized for monitoring and inspectorate staff per year | |
| | *1.3 Develop and implement additional regulations on Dam Safety and Effluent discharges* | ▪ Draft Dam Safety Regulations submitted to AGD by 2013<br>▪ Dam Safety Regulations adopted by parliament by end of 2013<br>▪ At least 50% NDSU staff recruited by 2014<br>▪ Draft effluent discharge regulation prepared by 2014 | |
| | *1.4 Ensure the protection and conservation of river basins and wetlands for water security as well as enhanced resilience and* | ▪ Buffer Zone Policy adopted by cabinet by 2013<br>▪ Legislative Instrument on Buffer zone developed and approved by Parliament by 2016<br>▪ Number of pilot interventions of the Buffer zone | |

| | | | |
|---|---|---|---|
| | *adaptation to climate change* | policy initiated by 2014<br>▪ Functioning climate change resilience and adaptation program for the sub-sector by 2014 | |
| 2 Enhance public awareness and education in water resource management issues | *2.1 Strengthen communication campaigns and education to stimulate interest and promote support for WRM-related initiatives* | ▪ Communication Strategy reviewed for 2012-2016<br>▪ Number of the communication campaigns and education tasks implemented per year. | |
| 3 Improve access to water resources knowledge base to facilitate water resources planning and decision making | *3.1 Improve data and information management* | ▪ Database on both surface and groundwater upgraded to cover entire country by 2014<br>▪ Recruit at least one GIS/data base expert to Manage data base by 2013<br>▪ At least 2 WRC technical personnel undertake training on water resources assessment, management and development | |
| | *3.2 Promote scientific investigations and research in water resources assessment, management and development.* | ▪ Number of collaborative/service agreements established for scientific investigations and research on targeted water resources and related issues.<br>▪ Number of models developed/adopted and utilized for investigations and decision making water resources and related issued. | |
| 4 Improve trans-boundary and international cooperation in the management of shared water resources | *4.1 Facilitate the development of bilateral and multilateral agreements/protocols to strengthen cooperation with riparian countries in shared basins* | • Number of bilateral trans-boundary waters agreements with riparian neighbours prepared by 2015<br>• Number of multilateral Transboundary waters arrangements and commitments made. | |
| 5 Ensure gender equity in water resources management and planning | *5.1 Develop and implement Gender strategy in Water resources Management;* | ▪ Number of the gender equity and sensitivity/responsiveness tasks implemented per year.<br>▪ Review the Gender Strategy on WRM by 2015 | |
| 6 Develop and operationalise a national M&E system to track progress in IWRM implementation | *6.1 Set-up a national M&E system for the implementation of IWRM* | ▪ Functioning and well coordinated M&E units established at River Basin Offices and the WRC Secretariat by 2013. | |

# ANNEX A: SUMMARY OF THE WATER SECTOR STRATEGIC DEVELOPMENT PLAN – THEMES, OBJECTIVES AND STRATEGIES

| **Thematic Area** | **Policy Objectives** | **Strategies** |
|---|---|---|
| Institutional Development and Capacity Building | (1) Improve institutional capacity across all levels and ensure that all institutional structures perform their roles efficiently and effectively | (1) Strengthen WD to effectively provide technical support to MWRWH to provide leadership for policy formulation, coordination, implementation and monitoring and evaluation of sector activities |
| | | (2) Strengthen the capacity of GWCL to provide efficient and reliable water services |
| | | (3) Strengthen the facilitative role of CWSA in rural and small towns water and sanitation service delivery |
| | | (4) Strengthen district level capacity for the delivery, operation and maintenance of water and sanitation facilities |
| Finance | (1) Ensure sustainable financing of investment and operation and maintenance cost in the water sector | (1) Increase public sector investment in the water sector |
| | | (2) Improve the sources of financing for the water sector |
| Water Services Delivery | (1) Improving access to potable water services (Achieve national water coverage of 80% by 2015 and 100% by 2025) | (1) Carry out rehabilitation and upgrading of reservoirs to restore and increase their capacities for urban water service delivery. |
| | | (2) Provide new water facilities and institute appropriate mechanism for rehabilitation, operation and maintenance of existing facilities |
| | | (3) Institutionalise a nationwide water quality monitoring framework |
| Water Related Sanitation and Hygiene | (1) Maximise health benefits through integration of water, sanitation and hygiene education interventions | (1) Promote safe sanitation and hygiene practices among all people; |
| | | (2) Support the integration of water, sanitation and hygiene education/promotion (including hand washing) interventions; |

| **Thematic Area** | **Policy Objectives** | **Strategies** |
|---|---|---|
| Water Resources Management | (1) Strengthen the regulatory and institutional framework for managing and protecting water resources for water security and enhancing resilience to climate change | (1) Enhance the implementation of existing regulations on WRM |
| | | (2) Develop and implement additional regulations on Dam Safety and Effluent discharges |
| | | (3) Ensure the protection and conservation of river basins and wetlands for water security |
| | | (4) Facilitate development of bilateral and multilateral agreements/protocols with countries in shared basins |
| | (2) Enhance public awareness and interest in water resource management issues | (1) Strengthen communication campaigns to stimulate interest and promote support for WRM-related initiatives |
| | (3) Improve access to water resources knowledge base to facilitate water resources planning and decision making | (1) Improve water resources data and information management |
| Research, Gender, Governance and M&E | (1) Promote generation, sharing and utilization of knowledge relevant to the water sector | (1) Support research, dissemination and discussion of research results on key issues affecting water and sanitation service delivery |
| | | (2) Promote scientific investigations and research in water resources |
| | (2) Provide evidence-based data and knowledge to improve decision making in the water sector | (1) Development and operationalisation of a national M&E system to track sector progress and contribute to the annual GSGDA update |
| | (3) Ensure gender equity in participation in water and sanitation issues at all levels | (1) Empowering both sexes to appreciate their complementary roles in water and sanitation service delivery. |
| | (4) Ensure that the water sector operates in a transparent and accountable manner | (1) Ensuring accountability and transparency through timely reporting and participatory discussion of results/issues in the water sector |
| | (5) Ensure an effectively harmonised and aligned water sector | (1) Facilitate effective coordination and collaboration of sector activities particularly among DPs, MWRWH, MoFEP and MLGRD. |

# ANNEX B: ACTION SHEETS

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet (Guide)</th></tr>
<tr><td colspan="2">Action n° 1.1.1<br>Action Area: 1</td><td colspan="2">Title of action: Review the IWRM component of the National Water Policy to address emerging challenges and clarify mandates and roles among stakeholders</td></tr>
<tr><td>Justification</td><td colspan="3">The National Water Policy needs to address the contemporary and emerging issues as changes in the water resources situation and associated development potentials are foreseen to appear in the wake of climate change, population increase and rural to urban migration. Stakeholder roles and responsibilities need to be defined accurately especially as new areas of concern and challenge will appear in the future.</td></tr>
<tr><td>Brief description</td><td colspan="3">The National Water Policy will be reviewed in the perspective of changes in the water resources situation and associated priorities and responsibilities. The review will start by identifying the areas in the policy that are critical, propose changes and supplements and include stakeholders in the process. The stakeholders will also be instrumental in outlining mandates and areas of responsibility. These responsibilities will be developed based on the existing institutional situation, capacities and capabilities, future opportunities and the severity of upcoming issues.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• A National Water Policy IWRM component which fully accounts for the emerging challenges<br>• A fully agreed definition of roles and responsibilities of both public and private sector institutions</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political consensus can be obtained<br>• Stakeholder groups can find common benefits in the reviewed policy and in the distribution of responsibilities</td></tr>
<tr><td>Risks</td><td colspan="3">• Political consensus and stakeholder opinions cannot be harmonized</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Stakeholder workshops</td></tr>
<tr><td>Human resources</td><td colspan="2">Government staff, policy advisers and facilitators</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Consultancy</td><td>50,000.00</td></tr>
<tr><td>Stakeholder consultations/workshops</td><td>45,000.00</td></tr>
<tr><td>Development of reviewed policy</td><td>20,000.00</td></tr>
<tr><td>Total</td><td>115,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">The review may be repeated every 5 years</td></tr>
<tr><td>Financial source</td><td colspan="3">GoG, Private sector, Development partners<br><br>For the action: GoG and Development partners<br>For recurrent costs: n/a</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: WRC and WD/MWRWH<br>Partners: Key stakeholders within water supply, irrigation, hydropower and disaster risk management</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Public and private sector, rural and urban communities</td></tr>
<tr><td>Implementation Schedule</td><td colspan="3">1 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">Action 1.1.1 is an umbrella action and as such it has links to all the actions from the action list</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet (Guide)</th></tr>
<tr><td colspan="2">Action n° 1.2.1<br>Action Area: 1</td><td colspan="2">Title of action: Assess and review existing drilling license and groundwater development regulations</td></tr>
<tr><td>Justification</td><td colspan="3">The drilling and groundwater development regulations need to be reviewed and updated to ensure it fully achieves its aim</td></tr>
<tr><td>Brief description</td><td colspan="3">Drilling licenses issued to drilling companies currently seems to cover operations related to water supplies only. There are however, drilling operations, which intercept groundwater in both shallow and deep aquifers, which have not been adequately, capture by the current provisions in the regulations. Typically among these include drilling operations in relation to mineral exploration and geotechnical investigation.<br>The provisions in the current regulations in respect of field data management and transfer mechanisms to the Commission does not seem to meet the intended objectives of the regulations and therefore need for a review to strengthen the data transfer mechanisms to improve on field data transfer to WRC.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Updated regulations with a wider coverage/scope<br>• Improved hydrogeological data acquisition<br>• Quality of hydrogeological data enhanced<br>• Reduced risk of groundwater contamination</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Revised Regulations will be approved and timely too<br>• Maximum cooperation from all drilling operators<br>• Cooperation from other sector players, e.g. clientele of drilling operators<br>• Adequate human resource for field monitoring and data validation<br>• Data transferred to the Commission in the appropriate format and timely</td></tr>
<tr><td>Risks</td><td colspan="3">• Inadequate human capacity to enforce regulations</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Meetings and Stakeholder workshops</td></tr>
<tr><td>Human resources</td><td colspan="2">Government staff, and groundwater consultants</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table><tr><td>Government staff (WRC etc.)</td><td>15,000</td></tr><tr><td>National consultants</td><td>25,000</td></tr><tr><td>Total</td><td>40,000</td></tr></table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">The review may be updated every five years</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana<br>For recurrent costs: n/a</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission<br>Partners: WD-MWRWH/WRI/CWSA/EPA/AGD/Consultants/Drilling Contractors/Mining Community</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Water users, water planners and managers, project consultants, researchers and other data users and water sector investors</td></tr>
<tr><td>Implementation Schedule</td><td colspan="3">1 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to 1.2.2 on capacity building and 1.3.3 on wastewater discharge regulations</td></tr>
<tr><td>Remarks</td><td colspan="3">None.</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet (Guide)</th></tr>
<tr><td colspan="2">Action n° 1.2.2<br>Action Area: 1</td><td colspan="2">Title of action: Provide capacity building support to AGD and Security Services to enforce water resources management regulations and permit conditions.</td></tr>
<tr><td>Justification</td><td colspan="3">AGD and Security Services have inadequate capacity to monitor and enforce regulations on water management regulations. The capacity needs to be expanded in order to ensure water management regulations are properly enforced.</td></tr>
<tr><td>Brief description</td><td colspan="3">AGD and Security services are mandated to enforce by prosecuting offenders of water resources and environmental laws. Unfortunately they are not well versed with most of the regulations on environment and water resources. There is therefore the need to provide nationwide training to build the capacity of prosecutors and the AGD</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• AGD and Security Services have adequate capacity to monitor and enforce regulations</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Qualified candidates for training courses are available and motivated</td></tr>
<tr><td>Risks</td><td colspan="3">• The knowledge and skills developed are not put into practice</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics.</td><td colspan="2">Vehicles, workshop materials etc</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC staff</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50000</td></tr>
<tr><td>Training sessions</td><td>50000</td></tr>
<tr><td>National consultant</td><td>20000</td></tr>
<tr><td>Total</td><td>120,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Selected training courses may be repeated every 3 years</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC, AGD and EPA<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: ADG and EPA</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">AGD and Security services develop their capacity for enforcement, while the final beneficiaries are the water users in the different sectors.</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">6 months</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to 1.2.1 on licensing and regulations and 1.3.3 on regulations or wastewater discharge and 1.3.4 on enforcement of regulations on wastewater management</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet (Guide)</th></tr>
<tr><td colspan="2">Action n° 1.3.1<br>Action Area: 1</td><td colspan="2">Title of action: Establishment of a Dam Safety Unit</td></tr>
<tr><td>Justification</td><td colspan="3">Dams impose serious threats to society and a dam break can cause serious consequences in terms of deaths, injuries, damage to property and environment. A dam break could therefore present one of the largest catastrophes, which could affect Ghana. In general, society will need to ensure that adequate and uniform level of dam safety is maintained with respect to the failure consequence a dam imposes.</td></tr>
<tr><td>Brief description</td><td colspan="3">All the major dam owners in Ghana are represented in the WRC and the representation of all the major dam owners in the Commission can also prove to be an advantage, since this will ensure an interaction between the unit and the dam owner. Thereby the unit can become the vehicle for sound dialog and involvement in the decision making process. In this context, it will be very important that the different stakeholders are conscious of the different roles they have in the process.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Operational Dam Safety Unit with a legal leverage</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Consensus within the unit on issues to address<br>• Budget allocation</td></tr>
<tr><td>Risks</td><td colspan="3">• Non-availability of expert staff needed for the unit</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Computers, vehicles, workshops,</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs, International and local consultants</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>20,000</td></tr>
<tr><td>Logistics</td><td>40,000</td></tr>
<tr><td>Total</td><td>80,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Annual operation budget</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs<br>For recurrent costs: WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs, International partners (NVE)</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Dam owners and operators and the population in downstream flood plains</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">0ne Year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to 1.3.2 on dam safety regulations</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.3.2<br>Action Area: 1</td><td colspan="2">Title of action: Develop guidelines and regulations for dam safety (including operation rules for floods and evacuation plans)</td></tr>
<tr><td>Justification</td><td colspan="3">Dam safety and the operation during extreme events need to guided and regulations developed as more and more dams are being constructed and as climate change will influence the severity and occurrence of the extreme events and thus the pressure on the structures and spillways. Dams are an important factor in the water security situation.</td></tr>
<tr><td>Brief description</td><td colspan="3">The emerging Dam Safety Unit needs to set out guidelines and regulations. The guidelines will help designers during the initial phases, contractors during implementation and operators during the operation under normal conditions and under extreme events. The guidelines will aim to secure the structural safety of the dam, look at possible deterioration over time and check spillway function against expected increased floods. Dam breaks will be simulated and evacuation plans made. Regulations will set out the duties of the dam owners and operators within a legal framework The partners involved from a broad cross-section of designers, operators, users and other beneficiaries will discuss and document their agreements.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Concise and clear guidelines<br>• Regulations appropriate for monitoring and enforcement</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Consensus within the unit on guidelines and regulations<br>• Budget allocations for expert assistance to the unit</td></tr>
<tr><td>Risks</td><td colspan="3">• The Dam Safety Unit and operators/owners have conflicting views</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Workshops and seminars</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, VD, VRA, GIDA, MJ-AGD, EPA, GWCL, MMDAs, NADMO, GMet</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>500,000</td></tr>
<tr><td>National consultants</td><td>150,000</td></tr>
<tr><td>Workshop</td><td>50,000</td></tr>
<tr><td>Secretariat</td><td>30,000</td></tr>
<tr><td>Total</td><td>780,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Revisions of guidelines and regulations may take place after 5 years</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs, NADMO and G-Met<br>For recurrent costs: Government of Ghana through WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs, NADMO and G-Met</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WRC, VD, VRA, GIDA, EPA, GWCL, MMDAs, NADMO and G-Met</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Dam owners and operators and the population in downstream flood plains</td></tr>
<tr><td>Implementation Schedule</td><td colspan="3">2 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to 1.3.1 on establishment of dam safety unit</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.3.3<br>Action Area: 1</td><td>Title of action: Develop regulations for wastewater/effluent discharge</td></tr>
<tr><td>Justification</td><td colspan="2">Wastewater discharge constitutes one of the most important factors in the control of the pollution, and can affect the health and usefulness of water in all its uses. Regulations for Wastewater Discharge will allow efficient interventions to control pollution.</td></tr>
<tr><td>Brief description</td><td colspan="2">The wastewater discharge regulations have to be either based on the polluter pays principles and will set limits for concentrations or on amounts of pollutants discharged to a receiving water body. Stakeholder consultations and participation will be assisting the process of drafting the regulations. Regulations will describe the required pollution reducing measures by the polluters including application, discharge control and reporting.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• A set of efficient and effective regulations controlling wastewater discharge in accordance with the national priorities for ambient water quality</td></tr>
<tr><td>Assumptions</td><td colspan="2">• National priorities for ambient water quality developed (Ghana Raw Water Quality Guidelines and Criteria and Guidelines for Sector Specific Effluent Discharge)</td></tr>
<tr><td>Risks</td><td colspan="2">• Conflicting interests between polluters and regulators create barriers to the development of regulations</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Workshops and seminars</td></tr>
<tr><td>Human resources</td><td>WRC, AGD, GIDA, EPA, GWCL, Relevant MDAs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Government staff (WRC operational cost)</td><td>35,000</td></tr>
<tr><td>International Expert</td><td>150,000</td></tr>
<tr><td>National consultants</td><td>150,000</td></tr>
<tr><td>Workshops and seminars</td><td>80,000</td></tr>
<tr><td>Total</td><td>415,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Revisions of regulations may take place after 5 years where experience has been accumulated</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Government of Ghana through WRC, AGD, GIDA, EPA, GWCL, MDAs<br>For recurrent costs: Government of Ghana through WRC, AGD, VRA, GIDA, EPA, GWCL, MMDAs,</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: Water Resources Commission (WRC)<br>Partners: AGD, GIDA, EPA, GWCL, MDAs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Primary beneficiary is the aquatic environment and secondary beneficiaries are the water users</td></tr>
<tr><td>Implementation Schedule</td><td colspan="2">1.5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links to 1.2.1 on groundwater development regulations</td></tr>
<tr><td>Remarks</td><td colspan="2">None</td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.3.4<br>Action Area: 1</td><td>Title of action: Develop procedures and operational mechanisms for enforcement of regulations on wastewater management and pollution control</td></tr>
<tr><td>Justification</td><td colspan="2">Wastewater regulations will become effective and efficient only with control and enforcement</td></tr>
<tr><td>Brief description</td><td colspan="2">The initial task will be to develop the institutional framework for the enforcement of the wastewater regulations. The framework will describe and establish the details for monitoring, enforcement of license conditions, data collection and analysis. Further requirements will deal with how to enforce permits through cooperation, negotiations, and legal action. Logistics and instrumentation needs will have to be addressed.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• An effective, operational institutional framework that can handle monitoring and enforcement of wastewater discharge regulations</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Operational wastewater discharge regulations developed and agreed</td></tr>
<tr><td>Risks</td><td colspan="2">• Inadequate capacity and legal issues on conflicting and overlapping mandates</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Workshops and seminars</td></tr>
<tr><td>Human resources</td><td>WRC, EPA, MMDAs, AGD, Ghana Police</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Government staff (WRC operational cost.)</td><td>35,000</td></tr>
<tr><td>International Experts</td><td>150,000</td></tr>
<tr><td>National consultants</td><td>150,000</td></tr>
<tr><td>Workshops and seminars</td><td>80,000</td></tr>
<tr><td>Total</td><td>415,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Revisions of procedures may take place after 5 years, when experience has been accumulated</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Government of Ghana through WRC, EPA, MDAs, AGD, Ghana Police<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: Water Resources Commission (WRC)<br>Partners: EPA, MDAs, AGD, Ghana Police</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Primary beneficiary is the aquatic environment and secondary beneficiaries are the water users</td></tr>
<tr><td>Implementation Schedule</td><td colspan="2">1.5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links to 1.2.2 on capacity building in relation to enforcement of permit conditions on raw water abstraction</td></tr>
<tr><td>Remarks</td><td colspan="2">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.1<br>Action Area: 1</td><td colspan="2">Title of action: Prepare and update national and river basins IWRM plans</td></tr>
<tr><td>Justification</td><td colspan="3">IWRM plans will needs to be reviewed every 5 – 10 years to capture significant changes in the basins with regards to water resources situations and management issues. Water development opportunities and options change with time and therefore the need for periodic reviews. It is also important to develop river basin Plans for the rest of the basins to guide the development and management of their water resources.</td></tr>
<tr><td>Brief description</td><td colspan="3">So far six river basins IWRM plans have been developed and more basin plans will be developed to ensure that the water resources of those basins are sustainably management.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Updated and new IWRM plans covering the full territory of Ghana</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment and stakeholder interest and support</td></tr>
<tr><td>Risks</td><td colspan="3">• A balance of stakeholder interests cannot be reached</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Workshops and seminars, vehicles, etc</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, EPA, MMDAs, RBBs and NGOs etc</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>100,000</td></tr>
<tr><td>National consultants</td><td>300,000</td></tr>
<tr><td>Workshops and seminars</td><td>100,000</td></tr>
<tr><td>Total</td><td>550,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Revisions of IWRM plans may take place after 5 years, when significant changes have taken place</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC, WD/MWRWH. DPs<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners WD, EPA, MMDAs, RBBs and NGOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiaries are the sectoral water users and the aquatic environment while secondary beneficiaries are the national development and thus the people of Ghana</td></tr>
<tr><td>Implementation Schedule</td><td colspan="3">1 year for reviews of existing plans and 10 years for the development of 6 more basin plans</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is in its nature an umbrella and as such links to all the actions of the action list.</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.2<br>Action Area: 1</td><td colspan="2">Title of action: Establish River Basin Offices and Boards with adequate office accommodation and logistics</td></tr>
<tr><td>Justification</td><td colspan="3">IWRM needs to be practiced at all levels, from national over regional to community level. The logical unit to establish next after integrating IWRM at national level in Ghana is the river basin level.</td></tr>
<tr><td>Brief description</td><td colspan="3">This action will develop the river basin offices/organisations in terms of allocating/employing qualified water resources management staff, secretariat staff and designating members of the River Basin Board. Physical facilities in terms of office space have to be identified preferably close to partner organisations. The mandate, areas of responsibility, operating procedures, practices and budget process and reporting will have to be developed for the specific river basins. Office equipment in terms of phones and computers, desks and supplies will have to be procured. Logistic needs in terms of vehicles have to be addressed.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• An operational, IWRM based, River Basin Organisation suitable to support the national development goals</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment and budget allocation</td></tr>
<tr><td>Risks</td><td colspan="3">• Inadequate support from central level</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Staff, office space and logistics</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD/MWRWH</td></tr>
<tr><td>Budget estimate per basin office (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>20,000</td></tr>
<tr><td>Office space and computers</td><td>200,000</td></tr>
<tr><td>Vehicles</td><td>80,000</td></tr>
<tr><td>Total</td><td>300,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Office space, salaries, O & M of vehicles</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners WD/MWRWH, EPA, AGDs, NGOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiaries are the sectoral water users and the aquatic environment while secondary beneficiaries are the river basin development and thus the people in the basin</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">1 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.1.1 on the policy framework for IWRM, to 1.2.1. on licensing, to 1.2.2 on enforcement of permit conditions and 1.3.4 on enforcement of wastewater management.</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.3<br>Action Area: 1</td><td colspan="2">Title of action: Implement the buffer zone policy for protection and restoration of rivers, water bodies and wetlands</td></tr>
<tr><td>Justification</td><td colspan="3">An effective buffer zone policy has been developed and need to be approved and implemented in order to protect rivers and water bodies. The implementation of the buffer zone policy will address multiple water resources management issues related to water Quality and quantity as well as land degradation.</td></tr>
<tr><td>Brief description</td><td colspan="3">A nationwide implementation of the buffer zone policy requires a concerted effort at all levels from national to regional and local level. Institutions with interests in water and natural resources will have to be mobilised along with communities. Awareness raising on the benefits of buffer zones is the first step in the mobilization. Priorities will have to be developed so that establishment of buffer zones can start where they will benefit the aquatic environment the most. Selected plants/trees need to be planted in the buffer zone to gain the full benefit.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Buffer zones established at priority locations</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Support from all levels and in particular local communities</td></tr>
<tr><td>Risks</td><td colspan="3">• Conflict of interest with agriculture</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Nurseries, transport, unskilled labour</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, EPA, MMDAs, RBBs, NGOs, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>100,000</td></tr>
<tr><td>International Experts</td><td>100,000</td></tr>
<tr><td>National consultants</td><td>400,000</td></tr>
<tr><td>Unskilled labour</td><td>100,000</td></tr>
<tr><td>Workshops and seminars</td><td>50,000</td></tr>
<tr><td>Awareness raising</td><td>50,000</td></tr>
<tr><td>Nurseries</td><td>40,000</td></tr>
<tr><td>Vehicles</td><td>500,000</td></tr>
<tr><td>Total</td><td>1,340,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Maintenance of buffer zone vegetation</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WD, EPA, MMDAs, RBBs, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiary is the aquatic environment and water users while secondary beneficiaries are the population depending on the productive ecosystems</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.4.4 on legal instruments for buffer zone policy implementation</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.4<br>Action Area: 1</td><td colspan="2">Title of action: Formulate legal instruments for buffer zone policy implementation</td></tr>
<tr><td>Justification</td><td colspan="3">For the buffer zone policy to be effectively implement, there is the need to develop legislative Instrument to give it the legal leverage for enforcement of aspects of the policy</td></tr>
<tr><td>Brief description</td><td colspan="3">Possible gaps in water law and environmental protection laws in relation to buffer zones have to be filled and regulations prepared accordingly. Mandates for RBOs need to include the establishment of buffer zones in cooperation with district authorities and communities</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Legal instruments/regulations supporting establishment of buffer zones</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment</td></tr>
<tr><td>Risks</td><td colspan="3">• Conflict of interest with agriculture</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Workshops</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, MJ-AGD, EPA, MMDAs, RBBs, NGOs, CBOs, consultants</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>20,000</td></tr>
<tr><td>National consultants</td><td>60,000</td></tr>
<tr><td>Workshops and seminars</td><td>50,000</td></tr>
<tr><td>Awareness raising</td><td>50,000</td></tr>
<tr><td>Total</td><td>180,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WD, EPA, MMDAs, RBBs, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiary is the aquatic environment while secondary beneficiaries are the population depending on the productive ecosystems</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">1 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.4.3 on buffer zone policy implementation</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.5<br>Action Area: 1</td><td colspan="2">Title of action: Develop and implement strategic policy framework for rainwater harvesting</td></tr>
<tr><td>Justification</td><td colspan="3">Rainfalls patterns in Ghana and in particular in Northern Ghana have long dry spells. In many areas population and their agricultural activities are dependent on water stored during the wet spells. Rainwater harvesting is one of the methods, which can assist the necessary storage. The need for such storage is expected to increase over time due to the impacts of climate change.</td></tr>
<tr><td>Brief description</td><td colspan="3">Demonstration rainwater harvesting has been implemented in Northern Ghana and an on-going project supported by DANIDA continues implementation of rainwater harvesting programs. Selected communities implement small earth dams, underground reservoirs and roof collection in storage cylinders. Experience from these rainwater harvesting programmes will together with policies for water conservation methods form the background for a strategic policy framework. Implementation of the framework will again use experience and lessons learned from the previous programmes.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• A strategic policy framework which will direct and guide rainwater harvesting in coordination with soil water conservation</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment</td></tr>
<tr><td>Risks</td><td colspan="3">• Lack of consensus</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Workshops</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, CWSA, EPA WRI, MMDAs, RBBs, NGOs, CBOs, Consultants</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>Awareness creation</td><td>100,000</td></tr>
<tr><td>National consultants</td><td>70,000</td></tr>
<tr><td>Workshops and seminars</td><td>30,000</td></tr>
<tr><td>Total</td><td>250,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WD, EPA, MMDAs, RBBs, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiary is the rural water user / agriculturist</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">1 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.4.6 on climate change adaptation and 1.4.7 on promotion of climate change adaptation</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.6<br>Action Area: 1</td><td colspan="2">Title of action: Incorporate climate change adaptation in water conservation strategies (ADAPTS Approach)</td></tr>
<tr><td>Justification</td><td colspan="3">Water related hazards such as floods have become more frequent and the unpredictable rainfall pattern has adversely affected rain fed agriculture. It is therefore important to incorporate climate change adaptation in water management plans and policies</td></tr>
<tr><td>Brief description</td><td colspan="3">The ADAPTS approach to climate change adaptation builds on the needs, priorities and actions of local people and their communities and ensures that adaptation considerations are effectively incorporated into water policies, plans and investment strategies.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Climate change adaptation incorporated in water conservation strategies</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment</td></tr>
<tr><td>Risks</td><td colspan="3">• Lack of consensus</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Workshops and seminars</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD/MWRWH, EPA, GWCL, MMDAs, RBBs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>100,000</td></tr>
<tr><td>National consultants</td><td>100,000</td></tr>
<tr><td>Workshops and seminars</td><td>50,000</td></tr>
<tr><td>Total</td><td>300.000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WD, EPA, MMDAs, RBBs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiary is the rural water user / agriculturist</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.4.6 on climate change adaptation and 1.4.7 on promotion of climate change adaptation</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 1.4.7<br>Action Area: 1</td><td colspan="2">Title of action: Promote community to national level approach to adapting to climate change (ADAPTS Approach)</td></tr>
<tr><td>Justification</td><td colspan="3">Climate change adaptation will be more and more needed over time in order to maintain productive and social activities. As a first step in adaptation, promotion of the identification up scaling of locally based interventions and adaptation strategies is imperative. The involvement of community and local people in defining and developing adaptation measures is essential for ownership and sustainability.</td></tr>
<tr><td>Brief description</td><td colspan="3">The ADAPTS approach to climate change adaptation builds on the needs, priorities and actions of local people and their communities and ensures that adaptation considerations are effectively incorporated into water policies, plans and investment strategies.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Improved livelihoods and full involvement of local people in the planning and development of climate change adaptation measures.</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Political commitment to launch campaign</td></tr>
<tr><td>Risks</td><td colspan="3">• Communication messages are not clear to the receivers</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Workshops, meetings, communication materials and seminars</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, EPA, MMDAs, RBBs, NGOs, NADMO, CBOs, Research Institutions</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>20,000</td></tr>
<tr><td>Logistics/promotional material</td><td>100,000</td></tr>
<tr><td>National consultants (NGOs)</td><td>100,000</td></tr>
<tr><td>Support to Communities and Workshops and seminars</td><td>500,000</td></tr>
<tr><td>Total</td><td>720,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission (WRC)<br>Partners: WD, EPA, MMDAs, RBBs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Primary beneficiary is vulnerable communities</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is linking to 1.4.6 on climate change adaptation and 1.4.7 on promotion of climate change adaptation</td></tr>
<tr><td>Remarks</td><td colspan="3">None</td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td>Action n° 2.1.1<br>Action Area: 2</td><td colspan="2">Title of action: Implement the reviewed IWRM communication strategy (including messages and materials) for sustained and enhanced public awareness and education on the management of water resources.</td></tr>
<tr><td>Justification</td><td colspan="2">IWRM awareness needs to be sustained, as public knowledge on IWRM should be enhanced.</td></tr>
<tr><td>Brief description</td><td colspan="2">The IWRM communication strategy (2012-2016) has been developed to support further implementation of IWRM at the various levels of society. The next step is to carry out the communication interventions to facilitate a wider reach to the intended targets, plus to assist in tasks related to communication and information sharing in climate change and climate change adaptation. The strategy would also be subjected to ongoing review and update as activities are carried out and implemented.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Implemented reviewed IWRM strategy</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Political commitment to launch campaign</td></tr>
<tr><td>Risks</td><td colspan="2">• Communication messages are still not clear to the receiver</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td>Workshops, media events, communication materials and seminars</td></tr>
<tr><td>Human resources</td><td>WRC, WD, CWSA, VRA, EPA, GWCL, MMDAs, RBBs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>National Consultants</td><td>80,000.00</td></tr>
<tr><td>Media events</td><td>250,000.00</td></tr>
<tr><td>Workshops and seminars</td><td>170,000.00</td></tr>
<tr><td>Communication materials (flyers, documentaries, billboards, etc.)</td><td>400,000.00</td></tr>
<tr><td>Total</td><td>900,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">None</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Government of Ghana through WRC<br>For recurrent costs: Government of Ghana through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: Water Resources Commission (WRC)<br>Partners: WD, CWSA, VRA, EPA, GWCL, MMDAs, RBBs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Primary beneficiary is the water users / agriculturists, secondary beneficiaries are those parts of the population which depend on the productive and environmental use of water resources</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action is linking to 1.4.6 on climate change adaptation and 1.4.7 on promotion of climate change adaptation</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 2.1.2<br>Action Area: 2</td><td colspan="2">Title of action: Collate best practices on IWRM and disseminate ‘lessons learned’ at local, national and transboundary levels</td></tr>
<tr><td>Justification</td><td colspan="3">IWRM is a complex concept and a collection of best practices and lessons learned is of great value to the practitioners. Such material will help avoid mistakes of others on similar initiatives made in the past and make implementation of the IWRM Plan cost effective and result in increased knowledge and awareness and better education on IWRM</td></tr>
<tr><td>Brief description</td><td colspan="3">An inventory of projects and programmes based on IWRM principles will be made. Based on the inventory and interviews with stakeholders and lead agencies, best practices and lessons learned will be derived from each case. Practices and lessons will be compared across the projects and programmes and generic experience will be documented. The generic experience could, for instance relate to stakeholder consultations, awareness raising and empowerment, communication and IWRM messages, data and information collection, use and sharing and dissemination at all levels.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Improved appreciation of IWRM issues and how to address these<br>• Increased IWRM awareness and stakeholder participation<br>• Improved spatial planning for water resource management<br>• District Medium Term Plans with appropriately mainstreamed IWRM issues</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Adequate documentation is available for projects and programmes based on IWRM</td></tr>
<tr><td>Risks</td><td colspan="3">• The amount of material is not large enough to draw generic lessons and find best practices</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td colspan="2">Workshops, meetings and questionnaires</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, CWSA, VRA, EPA, GWCL, MMDAs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>80,000</td></tr>
<tr><td>Logistics</td><td>100,000</td></tr>
<tr><td>National consultants</td><td>100,000</td></tr>
<tr><td>Workshops and seminars</td><td>100,000</td></tr>
<tr><td>Total</td><td>380,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: GoG through WRC<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: WRC,<br>Partners: WD, CWSA, VRA, EPA, GWCL, MMDAs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct beneficiaries: Communities, MMDAs, sectoral agencies, practitioners<br>Indirect beneficiaries: Those parts of the population which depend on the productive and environmental use of water resources</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">1year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This is an umbrella action and as such it relates to all actions relating to IWRM</td></tr>
<tr><td>Remarks</td><td colspan="3">GWP has prepared a Toolbox of good practices in IWRM. The Toolbox is available on the internet. A huge amount of training material on IWRM aspects is available from Cap Net and can be downloaded from the home page.</td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 2.1.3<br>Action Area: 2</td><td colspan="2">Title of action: Intensify education and training in IWRM at all levels</td></tr>
<tr><td>Justification</td><td colspan="3">IWRM is a complex concept and in addition to awareness raising there should be education and training at all levels to ensure sustained knowledge of IWRM, its principles and their application.</td></tr>
<tr><td>Brief description</td><td colspan="3">This action will include an inventory of education and training in IWRM at higher learning institutions. Where the curricular are considered inadequate, proposals for extended curricular will be made. Likewise, in learning institutions, IWRM should be mainstreamed in education within areas such as water supply and sanitation, irrigation and agriculture, environment and aquatic ecology. Approaches for each level: community, district, regional and national need to be worked out in coordination with other educational and training efforts.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Improved appreciation of IWRM issues and how to address these<br>• Increased IWRM awareness and stakeholder participation<br>• Improved spatial planning for water resource management</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Educational institutions are willing to expand their curricular and establish training courses</td></tr>
<tr><td>Risks</td><td colspan="3">• Students and trainees are not employed in institutions where their knowledge is appreciated and subsequently used</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Meetings and questionnaires</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, CWSA, VRA, EPA, GWCL, MMDAs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>National consultants</td><td>100,000</td></tr>
<tr><td>Meetings and questionnaires</td><td>100,000</td></tr>
<tr><td>Total</td><td>250,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: GoG through WRC<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: WRC,<br>Partners: WD, CWSA, VRA, EPA, GWCL, MMDAs, NGOs, NADMO, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct beneficiaries: Communities, MMDAs, sectoral agencies, practitioners, students<br>Indirect beneficiaries: Those parts of the population which depend on the productive and environmental use of water resources</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">2years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This is an umbrella action and as such it relates to all actions dealing with IWRM</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th colspan="4">Ghana IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n°3.1.1<br>Action Area: 3</td><td colspan="2">Title of action: Support the set-up, rehabilitation, and upgrade the hydro-meteorological monitoring networks as well as introduce new technologies for data collection and analysis.</td></tr>
<tr><td>Justification</td><td colspan="3">Reliable and authentic data collection and analysis is paramount to sound decisions in water resources management. Climate change accentuates the need for updated information with good geographical resolution</td></tr>
<tr><td>Brief description</td><td colspan="3">This action will take inventory of hydro-meteorological stations and design the full network with an increase the number of hydro-meteorological stations to reach the information goals of the network. Present hydro-meteorological stations that are in poor state will be rehabilitated and upgraded and automation of data collection platforms will be made to reduce manpower requirements for systems operation. Collaboration with MMDAs for the security of systems will be initiated.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Improved coverage in respect of hydro-meteorological stations<br>• Improved, high quality data acquisition, analysis and presentation</td></tr>
<tr><td>Assumptions</td><td colspan="3">• MMDAs/chiefs/land owners will make land available for new stations<br>• Qualified hydro-meteorological staff available for operation</td></tr>
<tr><td>Risks</td><td colspan="3">• Vandalism and pilfering<br>• Interference with stream flow stations by illegal mining operations</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Equipment, vehicles, installation tools, telecommunication infrastructure,</td></tr>
<tr><td>Human resources</td><td colspan="2">Technicians, contractors and consultants.</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Government staff (WRC etc.)</td><td>100,000</td></tr>
<tr><td>Hydromet station equipment</td><td>4,000,000</td></tr>
<tr><td>Hydrological station equipment</td><td>100,000</td></tr>
<tr><td>Vehicles</td><td>800,000</td></tr>
<tr><td>Tools</td><td></td></tr>
<tr><td>Total</td><td>5,000,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">Training, servicing equipment, consumables (est. 1 mill USD)</td></tr>
<tr><td>Financial source</td><td colspan="3">GoG, Donor Partners, MMDAs</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: HSD and GMet<br>Partners: WRC</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Users of hydrological and hydro-meteorological data (e.g. WRC, RBBs, AGD and individual farmers)</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">5years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links with 3.1.2 on groundwater information, 3.1.3 on water quality management, 3.1.4. on monitoring of climate elements and 3.1.5 on databases</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.1.2<br>Action Area: 3</td><td>Title of action: Implement the “Groundwater Management Strategy” nationwide under a decentralised stakeholder engagement model for sustained groundwater management in Ghana.</td></tr>
<tr><td>Justification</td><td colspan="2">Responsive groundwater policies, actions, and services are required to ensure the safety of the people, to enhance economic activity, and to promote groundwater sustainability.</td></tr>
<tr><td>Brief description</td><td colspan="2">This action will strive towards executing a road map of investments and actions for strengthening policies and regulations for the protection and the long-term sustainability of Ghana’s groundwater resources under an IWRM framework; promote the efficient collection and analysis of groundwater data and information to support activities of productive use sectors; and engage in national, regional and international cooperation in the field of groundwater management.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Strengthened capacity in the technical and institutional aspects of groundwater assessment, planning, and development<br>• Broad stakeholder engagement of central, regional, and local governance institutions;<br>• Improved groundwater resource management and development under an IWRM framework.</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Qualified staff available for operations</td></tr>
<tr><td>Risks</td><td colspan="2">• A shared partnership cannot be reached</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Equipment, vehicles, telecommunication infrastructure,</td></tr>
<tr><td>Human resources</td><td>WRC, NNRI/GAEC, WRI, WD, MMDAs, AG’s Dept., CWSA</td></tr>
<tr><td>Budget estimate</td><td colspan="2"><table>
<tr><td>Government staff (WRC etc.)</td><td>80,000.00</td></tr>
<tr><td>International experts</td><td>450,000.00</td></tr>
<tr><td>National consultants</td><td>400,000.00</td></tr>
<tr><td>Training</td><td>150,000.00</td></tr>
<tr><td>Equipment</td><td>500,000,00</td></tr>
<tr><td>Vehicles</td><td>120,000.00</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>1,700,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Training, servicing equipment, consumables</td></tr>
<tr><td>Financial source</td><td colspan="2">GoG through WRC, WRI, WD, MMDAs, NNRI/GAEC, CWSA</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: NNRI/GAEC; WRI, AG’s Dept., CWSA</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Users of groundwater data (e.g. WRC, RBBs, AGD and individual farmers)</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">5years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links with 3.1.3 on water quality management, 3.1.4. on monitoring of climate elements and 3.1.5 on databases</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.1.3<br>Action Area: 3</td><td>Title of action: Strengthen water quality monitoring and data assessment including ecological/biological monitoring and further development of water quality guidelines and criteria.</td></tr>
<tr><td>Justification</td><td colspan="2">Reliable ambient water quality data are necessary for management of water resources to maintain productive ecosystems, environmental values, biodiversity and to set standards for discharge of wastewater and license abstraction of raw water.</td></tr>
<tr><td>Brief description</td><td colspan="2">The on-going water quality monitoring network will be reviewed accordingly taking cognisance of hotspots and specific, industries and water use activities. Stations may be established with the objective of assessing different situations, environmental concerns and vulnerability of the water source to pollution. The action will address the critical issues of sampling, transport, analysis, quality assurance and water quality information dissemination. Staff undertaking this activity will have to be adequately trained.. The action will also address further review of existing water quality guidelines and criteria.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Knowledge of ambient water quality<br>• Knowledge of biological / ecologic state of the water body<br>• Science-based water resources management</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Assistance from MMDAs, chiefs and landowners<br>• Decentralized laboratories<br>• Cooperation with stream flow gauging staff</td></tr>
<tr><td>Risks</td><td colspan="2">• Sampling and transport of samples unreliable<br>• Lack of reference laboratory</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Construction/rehabilitation/expansion and equipping of water/ecological laboratories<br>Provision of vehicles</td></tr>
<tr><td>Human resources</td><td>Recruitment and training of technicians and laboratory staff</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Government staff (WRC etc.)</td><td>80,000</td></tr>
<tr><td>National consultants</td><td>100,000</td></tr>
<tr><td>Establish 7 decentralised laboratories</td><td>3,500,000</td></tr>
<tr><td>Rehabilitation of existing laboratories</td><td>500,000</td></tr>
<tr><td>Laboratory equipment</td><td>500,000</td></tr>
<tr><td>Monitoring equipment</td><td>130,000</td></tr>
<tr><td>Vehicles</td><td>190,000</td></tr>
<tr><td>Total</td><td>5,000,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Vehicle operation and laboratory consumables (est. USD 500,000)</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Development partners and GoG<br>For recurrent costs: Donor partners, GoG, service delivery to private Sector</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: EPA, WRI, GWCL, CWSA, NNRI</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Users of water quality data (e.g. RBBs, Water Boards, farmers, industries, MMDAs,)</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links to Action 3.1.5 on data and information and Action 3.2.1 on water quantity and quality impacts</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.1.4<br>Action Area: 3</td><td>Title of action: Monitor climate elements and create early warning systems</td></tr>
<tr><td>Justification</td><td colspan="2">Adaptation to climate change requires relatively long lead times and often large investments in infrastructure. It is therefore clear that climate parameters have to be monitored closely and those warnings have to be issued as soon as significant changes are detected.</td></tr>
<tr><td>Brief description</td><td colspan="2">The first tasks in the action on monitoring of climate elements is the selection of parameters to measure and development of a programme for data collection, transmission, analysis and presentation. Parameters such as temperature, rainfall, flood occurrence and drought occurrence are among the most important from the perspective of water resources management and development. From variations and trends in the parameters, consequences can be assessed and priorities developed for setting up of early warning systems.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Monitoring systems for climate change are functional<br>• Early warning systems for floods and droughts are developed and operational</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Hydro-meteorological networks are delivering reliable data with sufficient resolution<br>• Water quality monitoring is operational</td></tr>
<tr><td>Risks</td><td colspan="2">• Climate changes are non-linear and tipping points occur</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Collaboration with hydro-meteorological network operators</td></tr>
<tr><td>Human resources</td><td>WRC, GMet, HSD, WRI, EPA, NADMO</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>1,000,000</td></tr>
<tr><td>National consultants</td><td></td></tr>
<tr><td>Workshops and seminars</td><td>50,000</td></tr>
<tr><td>Monitoring equipment</td><td>100,000</td></tr>
<tr><td>Vehicles</td><td>100,000</td></tr>
<tr><td>Total</td><td>1,300,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Vehicle operation</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Development partners and GoG<br>For recurrent costs: Development partners, GoG</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: GMet, HSD, WRI, EPA, NADMO</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Vulnerable communities and Water resources managers (e.g. RBBs, Water Boards, farmers, industries, MMDAs,)</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">2 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links to Action 3.1.1 on hydro-meteorological networks, 3.1.5 on data and information and Action 3.2.1 on water quantity and quality impacts</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme– Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.1.5<br>Action Area: 3</td><td>Title of action: Strengthen human and technical capacities of institutions for data analysis and archiving including GIS-Driven Data and Information Databases on water related information (incl. also ecosystems, Socio-Culture, Economics) and models for analysis and Decision Making.</td></tr>
<tr><td>Justification</td><td colspan="2">The data from the data collection networks need to be put to good use in the most efficient manner in order to support the water resources management with sound science. This can only take place when the data collection is backed up by storage in easy accessible data bases, appropriate analyses and presentations.</td></tr>
<tr><td>Brief description</td><td colspan="2">The tasks in this action will aim to provide appropriate technical staff and the tools required for data storage and analysis. Professional staff and technicians will be trained in database design and use exploiting GIS as far as possible. Hydrological models, basin simulations, groundwater modelling, decision support systems and other tools need to be introduced and applied to the collected data. Information need to be generated and water related data on socio-economic and environment will be included in the databases.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Capacities and capabilities for data storage and analysis with GIS applications developed in selected institutions</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Reliable and consistent data available from the data collection networks<br>• Staff available for training</td></tr>
<tr><td>Risks</td><td colspan="2">• Trained staff move to other sectors</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td>GIS equipment, models and databases</td></tr>
<tr><td>Human resources</td><td>GWCL, HSD, GMet, WRI, WD, MMDA, NNRI</td></tr>
<tr><td>Budget estimate</td><td colspan="2"><table>
<tr><td>Government staff (WRC etc.)</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>200,000</td></tr>
<tr><td>National consultants</td><td>100,000</td></tr>
<tr><td>GIS and other software</td><td>150,000</td></tr>
<tr><td>Training</td><td>300,000</td></tr>
<tr><td>Total</td><td>800,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Continue training</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: GoG through WRC<br>For recurrent costs: GoG, through WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: GWC<br>Partners: GWC, HSD, GMet, WRI, WD, MMDA, NNRI</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Users of water resources data</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">3 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links to Action 3.1.1 on hydro-meteorological network, to Action 3.1.2 on groundwater information, to Action 3.1.3 on water quality monitoring and to Action 3.1.4 on climate monitoring and Action 3.2.1 on decision support models</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.2.1<br>Action Area: 3</td><td colspan="2">Title of action: Develop decision support models to assess and manage impacts on quality and quantity of water resources</td></tr>
<tr><td>Justification</td><td colspan="3">Decision support models enable water resources management and development to be made in an optimal manner for instance using multi criteria functions. They save time and manpower and provide results that are easily visualised</td></tr>
<tr><td>Brief description</td><td colspan="3">The task of this action is to develop a computerised model, which can simulate the physical and natural environment for making management decisions on water resources management for energy, water supply, agriculture, sanitation, water infrastructure constitutes a decision support model.<br>The key inputs are information on water resources – groundwater as well as surface water, digital terrain information, land use and water use. Outputs from the model include hydrographs in all parts of the water course system as well as groundwater inflow to the system. When there are projected shifts in the inputs and the new figures or variables are entered into the model, a different scenario appears and policy makers can make decisions to address the challenges or take advantage of new opportunities.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• An operational decision support model</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Data for effective development and running of the model exist<br>• The model should be anchored in an institution which would be responsible for operation including upgrading and updating</td></tr>
<tr><td>Risks</td><td colspan="3">• Lack of collaboration from stakeholder institutions</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td colspan="2">Funding; Computers, GPS, GIS and terrain models</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, MMDA, HSD, GMet, WRI</td></tr>
<tr><td>Budget estimate</td><td colspan="3"><table>
<tr><td>WRC staff</td><td>30,000</td></tr>
<tr><td>International experts</td><td>150,000</td></tr>
<tr><td>National consultants</td><td>170,000</td></tr>
<tr><td>Computers</td><td>20,000</td></tr>
<tr><td>GIS system (software),</td><td>20,000</td></tr>
<tr><td>GPS, terrain data</td><td>10,000</td></tr>
<tr><td>Total</td><td>400,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">The model may need review after say 3 years of operation</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana and Development Partners<br>For recurrent costs: Water Resources Commission</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission<br>Partners: WD, MMDA, HSD, GMet, WRI</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct beneficiaries will be the decision makers, while indirect beneficiaries will be those parts of the population who are dependent on rational water use and water security.</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">2 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to Action 3.1.1 on monitoring networks, Action 3.1.2 on groundwater information, Action 3.1.3 on quality monitoring, Action 3.1.5 on capacity for analysis and data storage,</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.2.2<br>Action Area: 3</td><td colspan="2">Title of action: Promote further hydrogeological investigations nationwide</td></tr>
<tr><td>Justification</td><td colspan="3">Under conditions of long dry spells the use of groundwater is particularly beneficial because of the large groundwater reservoirs that often exist. Further, groundwater quality is most often superior to surface water quality. However, in Ghana, too little is known about groundwater occurrence and quality to exploit this potential.</td></tr>
<tr><td>Brief description</td><td colspan="3">The task of this action is to promote hydrogeological investigations, which will lead to a more intensive use of the groundwater resource in the perspective of climate change and subsequent increase in extreme events (e.g. dry spells, droughts etc.). The promotion should take its starting point in the central institutions, from where information and messages should be ingrained in regional institutions including river basin authorities and finally also in district authorities and NGOs. A key message is “to look for groundwater” whenever new or supplementary water sources are needed. Groundwater databases need to be updated with information from drilling operations. Promotion of information sharing will thus be an important part of any campaign.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• Improved knowledge base and understanding of the hydrogeological setting and open access to reliable groundwater resource information promoted at all levels</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Human and institutional capacity adequate to carry out the required investigations</td></tr>
<tr><td>Risks</td><td colspan="3">• Lack of collaboration from stakeholder institutions</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td colspan="2">Communication specialists</td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WRI, GAEC/NNRI, WD, MMDAs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>WRC staff</td><td>50,000.00</td></tr>
<tr><td>Field Investigations</td><td>1,000,000.00</td></tr>
<tr><td>National consultants</td><td>300,000.00</td></tr>
<tr><td>Equipment/Computers/Software</td><td>150,000.00</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>1,500,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">The hydrogeological investigations may be repeated after 3 years</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: Government of Ghana through WRC<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Water Resources Commission<br>Partners: WRI, GAEC/NNRI, WD, MMDAs, CWSA</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct beneficiaries will be the decision makers for resource development, while indirect beneficiaries will be those parts of the population who are dependent on rational water use and water security.</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">3 year</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links to Action 3.1.2 on groundwater information, Action 3.1.3 on water quality and Action 3.1.5 on capacity for analysis and data storage,</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.2.3<br>Action Area: 3</td><td colspan="2">Title of action: Establish national forecasts for climate change based on global and regional models</td></tr>
<tr><td>Justification</td><td colspan="3">Establishing national climate change forecasts is necessary to make water availability projections and planning for allocation and use of water resources for domestic, agricultural and industrial activities; including hydropower generation. Forecasts are also needed to develop adaptation measures to meet extreme events, such as extreme floods and droughts and to make plans for disaster risk reduction and management</td></tr>
<tr><td>Brief description</td><td colspan="3">Regional Climate Models are already available (IPCC) in the region that Ghana is part of. However the regional climate models are of low resolution and have to be downscaled to Ghana level and below if possible. Downscaling needs to be validated against historical data on temperature and rainfall. The desirable model will, for suitable geographic units give projections of temperature and variations, rainfall patterns and quantity, discharge, frequencies, floods and droughts. In this manner projections of the impact of climate changes can be made and adaptation measures planned.</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• A model, which describes the climate situation of Ghana and allows projections of impacts of climate change into the future.</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Availability of sound scientific data<br>• Reliable Regional Models</td></tr>
<tr><td>Risks</td><td colspan="3">• Levels of inaccuracy too high for meaningful forecasts</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic</td><td colspan="2">Accurate regional models, computers, software, communication equipment</td></tr>
<tr><td>Human resources</td><td colspan="2">GMet, EPA, WRI, Universities</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>Gov staff</td><td>50,000</td></tr>
<tr><td>International Experts</td><td>100,000</td></tr>
<tr><td>National Consultants</td><td>160,000</td></tr>
<tr><td>Computers and Software</td><td>40,000</td></tr>
<tr><td>Total</td><td>350,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">The work will be reviewed, when more accurate regional models are available</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: GoG<br>For recurrent costs: GoG</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: Ghana Meteorological Agency<br>Partners: NADMO, EPA, SADA, MMDAs, Information Services Department (ISD)</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct: Whole population</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">1 year for setting up of model and followed by regular updating of information</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action links with Action 1.4.6 on climate change adaptation, Action 1.4.7 on national level approach to adaptation, Action 3.1.4 on early warning systems.</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

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<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 3.2.4<br>Action Area: 3</td><td>Title of action: Carry out research on strategies for adaptation to climate change</td></tr>
<tr><td>Justification</td><td colspan="2">Research needs to be carried out to get detailed and accurate information to enable future review of water resources management plans. Further, to identify suitable climate change adaptation strategies and to know which adaptation strategies will work in which areas and how best the strategies will be adopted by beneficiary communities.</td></tr>
<tr><td>Brief description</td><td colspan="2">A programme at research level, to study the existing strategies being used by local people in their coping or adaptation to the effects/impacts of climate change in order to: identify successful adaptation strategies, improve upon failing strategies, learn from lessons, and design more effective adaptation strategies to climate change</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Methodology for developing effective adaptation<br>• Recommendations for effective and sustainable adaptation strategies<br>• Research report to help in developing policy guidelines for climate change adaptation strategies<br>• Capacity Building of personnel who will be involved in the research programme</td></tr>
<tr><td>Assumptions</td><td colspan="2">• That the local/vulnerable already have some knowledge in adapting to climate change which must be built upon<br>• That the research output is readily available to all stakeholders<br>• That an effective communication network is established for all stakeholders to share their knowledge on climate change adaptation strategies</td></tr>
<tr><td>Risks</td><td colspan="2">• Stakeholders are not ready to accept new knowledge, ideas and skills for effective adaptation strategies<br>• Stakeholders do not share their knowledge on climate change adaptation strategies</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistic.</td><td>Vehicles, Research Equipment, data</td></tr>
<tr><td>Human resources</td><td>Research team (experts and technicians), drivers, administrative staff</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>GoG Staff</td><td>10,000</td></tr>
<tr><td>International experts</td><td></td></tr>
<tr><td>National Consultants</td><td>150,000</td></tr>
<tr><td>Vehicles</td><td>150,000</td></tr>
<tr><td>Training of technicians</td><td>20,000</td></tr>
<tr><td>Equipment</td><td>20,000</td></tr>
<tr><td>Facilitation of Data acquisition</td><td>20,000</td></tr>
<tr><td>Total</td><td>370,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Vehicle maintenance</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: Government of Ghana<br>For recurrent costs: Government of Ghana, WRC</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC (central body to host the programme)<br>Partners: Universities, CSIR, NGOs, VRA, FC, MWRWH, Min of Energy, MOFA, EPA,</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Direct: Rural climate-dependent livelihoods<br>Indirect: Those parts of the population which are involved in water sector dependent activities/production</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">5 years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This Action links with Action 1.4.6 on climate change and community resilience, Action 3.1.4 on early warning systems and Action 3.2.3 on forecasts for climate change</td></tr>
<tr><td>Remarks</td><td colspan="2">The research team should first collect all individual scattered project findings and studies on climate change adaptation strategies and build a database of existing knowledge</td></tr>
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<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td>Action n° 4.1.1<br>Action Area: 4</td><td colspan="2">Title of action: Initiate and adopt new protocols with Côte d’Ivoire on the joint management of the (Aby Lagoon-Bia-Tano) basin systems and with Togo on the Todzie-Aka basin system and shared groundwater resources</td></tr>
<tr><td>Justification</td><td colspan="2">Ghana aims at pursuing consultations and cooperation mechanisms governing the management of internationally shared water resources with her riparian neighbours (Côte d’Ivoire, Burkina Faso, and Togo). Protocols and agreements are needed with the aim of ensuring that shared river basins and aquifers will be developed for the reasonable and equitable benefit of all the countries concerned.</td></tr>
<tr><td>Brief description</td><td colspan="2">The task of this action is to initiate and conclude protocols and agreements with Côte d’Ivoire and Togo. The protocol with Cote d’Ivoire relates to the shared Bia River and the Tano river, which lower reaches also form part of the boundary with Cote d’Ivoire With respect to Togo, the protocol relates to the Todzie Aka-basin and a transboundary groundwater reservoir that exists. Here, groundwater levels and drawdown control the flow across the border and another set of conditions will have to be prepared in addition to the surface water.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Protocols for cooperation for the shared Aby Lagoon-Bia-Tano system with Cote d’Ivoire and for the Todzie-Aka and groundwater aquifer with Togo.</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Political will to cooperate<br>• Sound scientific data base</td></tr>
<tr><td>Risks</td><td colspan="2">• Conflicts of interest are a hindrance for agreement</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td>Decision support models for groundwater and river flows</td></tr>
<tr><td>Human resources</td><td>WRC, MWRWH, MFA, MJAGD, MMDAs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Meetings/workshops</td><td>100,000.00</td></tr>
<tr><td>Translation logistics</td><td>60,000.00</td></tr>
<tr><td>Consultants</td><td>80,000.00</td></tr>
<tr><td>International travels</td><td>100,000.00</td></tr>
<tr><td>Total</td><td>340,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">When next updating is found necessary</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: GoG<br>For recurrent costs: GoG</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC/MFA<br>Partners: MWRWH, MJAGD, MMDAs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Direct: Whole population</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">3-years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links with Action 1.4.6 on climate change adaptation, Action 1.4.7 on national level approach to adaptation, Action 3.1.4 on early warning systems.</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td>Action n° 4.1.2<br>Action Area: 4</td><td colspan="2">Title of action: Facilitate the country’s financial contribution, participation and implementation in international programmes and plans (e.g. ECOWAS, VBA, GEF-Volta, GWP/WA and AMCOW)</td></tr>
<tr><td>Justification</td><td colspan="2">Ghana emphasises international cooperation through regional and global institutions such as ECOWAS, VBA, GEF, GWP and AMCOW. Such international cooperation requires a clear commitment and dedication. It is necessary for such cooperation that the country’s focal points/institutions enhance the facilitation of their inputs.</td></tr>
<tr><td>Brief description</td><td colspan="2">The task of this action is to consolidate the international collaboration with regional and global institutions and enhance the inputs of the country’s focal points/institutions.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Improved involvement in international programmes and plans</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Political commitment to international cooperation</td></tr>
<tr><td>Risks</td><td colspan="2">• Failure to ensure financing of the cooperation</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logist., techn., scientif.</td><td>Fully qualified focal points</td></tr>
<tr><td>Human resources</td><td>WRC, WD, MWRWH, MoFEP, MFA, MJ-AGD, MMDAs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Focal point/institutions administration costs</td><td>20,000.00</td></tr>
<tr><td>Meetings/Consultations</td><td>65,000.00</td></tr>
<tr><td>International travels</td><td>35,000.00</td></tr>
<tr><td>Total</td><td>120,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">Annual cost of cooperation</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: GoG<br>For recurrent costs: GoG</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: MWRWH, MoFEP, MFA, MJ-AGD, MMDAs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Direct: Ghana Water Sector; indirect: Those depending on productivity in the water sector and the environment</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">Following the implementation schedules of the international programmes and plans</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action links with Action 4.1.1 on new protocols for joint management in shared basins</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td>Action n° 5.1.1<br>Action Area: 5</td><td colspan="2">Title of action: Implement the Gender and Water Resources Management Strategy</td></tr>
<tr><td>Justification</td><td colspan="2">Ghana’s Water Resources Management Strategy emphasises gender in the sense of equity in the role of men and women in water resources management. Implementation of this strategy is lagging behind and women need to play a more prominent role and be more involved in the management of water resources.</td></tr>
<tr><td>Brief description</td><td colspan="2">The task of this action is to institutionalize gender equity and sensitivity/responsiveness as an essential tool for achieving the sustainable use, management and development of the Ghana’s water resources. Women’s participation in committees, boards and working groups and administration need to be promoted in order for it to happen. The promotion has to start based on political commitment at high level. For instance, facilitators/promoters need to ensure that gender is mainstreamed in regulations, bye-laws and mandates for boards and other units and the “game plan” is followed.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Improved gender equity and sensitivity in policies, programmes and projects for efficient and sustained use, management and development of water resources</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Political commitment to gender equity</td></tr>
<tr><td>Risks</td><td colspan="2">• Inertia in male dominance</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics, technical</td><td>Facilitators/promoters operating at all levels</td></tr>
<tr><td>Human resources</td><td>WRC, WD</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="2"><table>
<tr><td>Consultancies/Facilitation</td><td>95,000.00</td></tr>
<tr><td>Training Costs</td><td>120,000.00</td></tr>
<tr><td>Workshops/Meetings</td><td>85,000.00</td></tr>
<tr><td>Awareness materials/ adverts, etc.</td><td>100,000.00</td></tr>
<tr><td>Total</td><td>400,000.00</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2"></td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: GoG<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: WD, EPA, MMDA, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Direct: Ghana Water Sector; indirect: Those depending on productivity in the water sector and the environment</td></tr>
<tr><td>Implementation Schedule</td><td colspan="2">3years</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action is an umbrella action and links in principle to all actions of the action programme</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

<table>
<tr><th colspan="4">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 6.1.1<br>Action Area: 5</td><td colspan="2">Title of action: Develop indicators</td></tr>
<tr><td>Justification</td><td colspan="3">The IWRM Action Programme has to be followed closely as to progress and impact. This require indicators and parameters that can be measured and that can contribute to clear and unambiguous progress or impact statements</td></tr>
<tr><td>Brief description</td><td colspan="3">The task of this action is to find progress and impact indicators that will show the effectiveness of the programme. Such indicators should be SMART meaning Specific, Measurable, Achievable, Relevant and Time-bound. Indicators can be either direct or measures the object by proxy. Development of indicator should take place the planning phase and be part of a logical framework analysis (LFA).</td></tr>
<tr><td>Expected outputs</td><td colspan="3">• A set of indicators giving a best possible status of progress and impact</td></tr>
<tr><td>Assumptions</td><td colspan="3">• Indicators are representing the progress and impact parameters fairly</td></tr>
<tr><td>Risks</td><td colspan="3">• Programme managers guide the programme towards achievement of indicators instead of towards sustainable impacts</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logist., techn., scientif.</td><td colspan="2"></td></tr>
<tr><td>Human resources</td><td colspan="2">WRC, WD, EPA, MMDAs, NGOs, CBOs</td></tr>
<tr><td>Budget estimate (GHC)</td><td colspan="3"><table>
<tr><td>WRC staff</td><td>10,000</td></tr>
<tr><td>Meetings/workshops</td><td>30,000</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>40,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="3">None</td></tr>
<tr><td>Financial source</td><td colspan="3">For the action: GoG<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="3">Responsible: WRC<br>Partners: WD, EPA, MMDAs, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="3">Direct : Ghana Water Sector ; indirect : Those depending on productivity in the water sector and the environment</td></tr>
<tr><td>Implementation schedule</td><td colspan="3">3 months</td></tr>
<tr><td>Relations with other actions</td><td colspan="3">This action is an umbrella action and links to all actions of the action programme</td></tr>
<tr><td>Remarks</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th colspan="3">IWRM Action Programme – Action Sheet</th></tr>
<tr><td colspan="2">Action n° 6.1.2<br>Action Area: 5</td><td>Title of action: Identify and implement mechanisms for monitoring and evaluation</td></tr>
<tr><td>Justification</td><td colspan="2">The IWRM Action Programme has to be followed closely as to progress and impact and the progress and impact have to be evaluated in order to follow its way towards the objective and if necessary change parts of the programme to become more effective and efficient.</td></tr>
<tr><td>Brief description</td><td colspan="2">The task of this action is to use the progress and impact indicators as the basis for a monitoring and evaluation exercise. The monitoring will inform about how the programme has moved and the evaluation will answer questions of why has it moved in the way described by the indicators. Following the evaluation the programme can be amended to move more efficiently towards the target.</td></tr>
<tr><td>Expected outputs</td><td colspan="2">• Programme status, performance and possible amendments</td></tr>
<tr><td>Assumptions</td><td colspan="2">• Monitoring based on the indicators gives a clear picture of the programme status</td></tr>
<tr><td>Risks</td><td colspan="2">• Indicators are poorly defined and many are qualitative statements</td></tr>
<tr><td rowspan="2">Means for implementation</td><td>Logistics</td><td></td></tr>
<tr><td>Human resources</td><td>WRC, WD, EPA, MMDAs, NGOs, CBOs</td></tr>
<tr><td>Budget estimate</td><td colspan="2"><table>
<tr><td>WRC staff</td><td>20,000</td></tr>
<tr><td>Meetings /workshops</td><td>50,000</td></tr>
<tr><td>National Consultants</td><td></td></tr>
<tr><td>Total</td><td>70,000</td></tr>
</table></td></tr>
<tr><td>Recurrent costs</td><td colspan="2">None</td></tr>
<tr><td>Financial source</td><td colspan="2">For the action: GoG<br>For recurrent costs:</td></tr>
<tr><td>Responsible for implementation</td><td colspan="2">Responsible: WRC<br>Partners: WD, EPA, MMDAs, NGOs, CBOs</td></tr>
<tr><td>Beneficiaries</td><td colspan="2">Direct : Ghana Water Sector ; indirect : Those depending on productivity in the water sector and the environment</td></tr>
<tr><td>Implementation schedule</td><td colspan="2">3 months</td></tr>
<tr><td>Relations with other actions</td><td colspan="2">This action is an umbrella action and links to all actions of the action programme</td></tr>
<tr><td>Remarks</td><td colspan="2"></td></tr>
</table>

# ANNEX C: REFERENCES AND WEBSITES

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