Study on the analysis of national institutions including ongoing/planned initiatives in Ghana

(Ghana)

Project Number: 53885

Final report

December 2008

UNEP GEF UNOPS

First published in Ghana in 2008 By the UNEP-GEF Volta Project.

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For citation purposes this document may be cited as:

UNEP-GEF Volta Project*, 2008.* Study on the analysis of national institutions including ongoing/planned initiatives in Ghana. *UNEP/GEF/Volta/NR GHANA.2/2008*

Table of contents

List of abbreviations and acronyms

AEA	Agricultural Extension Agents
AFD	Agence Francaise pour le Development
AWSDB	Association of Water and Sanitation Development Boards
BIRD	Bureau of Integrated Rural Development
CBO	Community-Based Organization
CCS	Centre for Cultural Studies
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency
CPWF	Challenge Programme on Water and Food
CSIR	Council for Scientific and Industrial Research
CSPS	Centre for Social and Political Studies
CWA	Cummulated Weighted Average
CWSA	Community Water and Sanitation Agency
DA	District Assembly
DANIDA	Danish International Development Agency
DCE	Department of Civil Engineering
DLC	Distance Learning Centre
DWSTs	District Water and Sanitation Teams
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
FC	Forestry Commission
GEF	Global Environmental Facility
GHS	Ghana Health Service
GoG	Government of Ghana
GIDA	Ghana Irrigation Development Authority
GPRS	Growth and Poverty Reduction Strategy
GSB	Ghana Standards Board
GTZ	German Agency for Technical Cooperation
GVP	GLOWA Volta Project
GWCL	Ghana Water Company Limited
HSD	Hydrological Services Department
HYCOS	Hydrological Cycle Observatory System
IFAD	International Fund for Agricultural Development
IRB	International River Basin
IRBM	International River Basin Management
ISSER	Institute of Statistical, Social and Economic Research
ITE	Institute for Technical Education
IUCN	international Union for the Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
KFW	Kreditanstalt für Wiederaufbau-Germany
KNUST	Kwame Nkrumah University of Science and Technology
LC	Lands Commission
LI	Legislative Instrument
LWMP	Land and Water Management Project
LWMU	Land and Water Management Unit
MC	Minerals Commission
MDG	Millennium Development Goals
M&E	Monitoring and Evaluation
MES	Ministry of Environment and Science
MLFM	Ministry of Lands, Forestry and Mines

MLGRD	Ministry of Local Government, Rural Development
MoFA	Ministry of Food and Agriculture
MoFEP	Ministry of Finance and Economic Planning
MOWAC	Ministry of Women and Children Affairs
MSD	Meteorological Services Department
MWRWH	Ministry of Water Resources, Works and Housing
NCWSP	National Community Water and Sanitation Programme
NGOs	Non-Governmental Organizations
NLC	National Liberation Council
PAGEV	Projet d'Amelioration de la Gouvernance de l'Eau dans le basin de la Volta
PURC	Public Utilities Regulatory Commission
R&D	Research and Development
RWSTs	Regional Water and Sanitation Teams
S&T	Science and Technology
SAP	Strategic Action Programme
SLM	Sustainable Land Management
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCC	Technology Consultancy Centre
TDA	Transboundary Diagnostic Analysis
TNC	Training Network Centre
ToR	Terms of Reference
UCC	University of Cape Coast
UDS	University for Development Studies
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education, Scientific and Cultural Organization
UN	United Nations
VBA	Volta Basin Authority
VRA	Volta River Authority
VRB	Volta River Basin
WARAP	West African Regional Action Plan
WATSANs	Water and Sanitation Committees
WB	World Bank
WHO	World Health Organization
WRC	Water Resources Commission
WREM	Water Resources Engineering and Management
WRESP	Water Resources and Environmental Sanitation Project
WRI	Water Research Institute
WRIS	Water Resources Information Services
WSDBS	Water and Sanitation Development Boards
WUA	Water Users Association

List of Tables

List of Figures

Executive Summary

The UNEP- GEF Volta River Basin Project for "Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area" is a regional initiative of six riparian countries comprising Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali and Togo. In order to achieve its objective of building capacity, improving knowledge, enhancing stakeholders involvement to support the effective management of VRB, a country specific study relating to analysis of National Institutions including ongoing/planned initiatives was carried out. The methodology used for the study comprised literature review, national stakeholder consultations, data collection and analyses.

The study showed that Institutional structures and legall frameworks have been established to some degree in Ghana for environmental management. The legal instruments establishing new institutions and strengthening exisitng ones for managing water resources in Ghana, and in particular the Volta Basin are summarized. The mandate, activties, institutional frameworks and the strengths, weaknesses, opportunities and threats are analysed and described in detail.

Institutional matrices have been developed and presented to show i) the magnitude of involvement of the identified institutions and actors in the water sector in issues related to surface water, groundwater, waste water, land management and integrated water resources management (IWRM) ; and ii) potential areas of collaboration with the GEF Project. The modalities for implementing the latter collaboration plan has been presented.

The analysis of perceptions of stakeholders of the GEF Project showed that most of them had no or little information of the project. However after they have been briefed through our interaction, most of them expressed the desire to collaborate with the project. Major concerns were however raised particularly in the area of training. Consequently, training needs were assessed and training plans and modules for different levels of stakeholders are proposed. Participatory development of plans for training and collaboration would be necessary to cater for specific stakeholder circumstances. Analysis of the training capacity of isntitutions showed that apart from KNUST, courses offered did not deal directly with IRB and IWRM issues. These areas were found to be relevant to most stakeholders. The course modules and available facilities for potential training in IWRM and IRB at KNUST have therefore been presented to cater for the manpower training needs for the sustainable management of the Volta Basin.

1 Introduction

1.1 Background and Goal

1. The UNEP/GEF Volta River Basin Project for "Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area" is a regional initiative of six riparian countries comprising Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali and Togo.

2. The project which has been designed to facilitate the integrated management, sustainable development and protection of natural resources of the Volta River Basin(VRB), plan to achieve its objectives by addressing priority regional transboundary issues and problems identified through an earlier preliminary transboundary diagnostic analysis(TDA) conducted in the basin. The project is expected to promote a more sectorally-coordinated management approach, based on Integrated Water Resources Management (IWRM) principles, both at the national and the regional levels, with a strong emphasis on an expanded role for all stakeholders

3. The long-term goal of the project is to enhance the ability of the countries to plan and manage, in a sustainable manner, the Volta catchment areas within their territories inclusive of the component aquatic resources and ecosystems.

4. The project comprises the following three main components with their associated objectives:

- **Specific objective 1:** Build capacity, improve knowledge, enhance stakeholder involvement to support the effective management of the VRB.
- **Specific objective 2:** Develop river basin legal, regulatory and institutional frameworks and management instruments for addressing transboundary concerns in the VRB and its downstream coastal area.
- **Specific objective 3:** Demonstrate national and regional measures to combat transboundary environmental degradation in the Volta Basin.

5. The project aims at contributing to regional integration, promoting coordination and dialogue among the riparian member countries and fostering the participation of the local populations and the stakeholders as far as the Volta River Basin resources are concerned. The project implementation shall lead to the formulation of a Strategic Action Programme (SAP) for the entire Volta River basin and contribute to the sustainable management of the basin.

6. In order to secure the strategic coherence of the actions and to efficiently implement the project, it is envisaged, under the Specific Objective n° 1, to enhance the capacity of national institutions on international river basin (IRB), identify, prepare and implement collaboration plan with ongoing/planned initiatives. It is under this framework that the present study is developed.

1.2 Aim of the study and expected results

7. The main objective of the study is to conduct a detailed analysis of national/regional institutions (including training gaps and training plan) and prepare a collaboration plan with ongoing and planned initiatives.

8. Key expected outputs of the study are:

- Analysis of relevant national and regional instructions completed and approved by PMU and National Focal Points
- Capacity building needs of national institutions, identified, prioritised and plan of operation of training developed and approved
- Plan for collaboration with ongoing/planned initiatives developed and approved

1.3 Methodology

9. In the execution of the assignment, the consultant worked with the National Project Coordinator to provide:

- the key institutions involved or likely to be involved in the GEF-Volta project or Volta River Basin management;
- all available relevant literature;
- all on-going and planned initiatives, in the basin, in order to achieve the necessary synergies and complementarities at the level of the development of the contents of the plan for collaboration, training plans and their implementation.

10. The following methodology was used for the execution of the assignment:

- Literature Review/Desk Studies;
- National Stakeholder Institutions Consultations/Data collection;
- Data Analyses;
- Report writing

2 Detailed National Institutions Analysis

11. In the context of water resources management, institutions may be defined as organizations, working rules or establishments founded for specific purpose of public interest based on an accepted custom, law or relationship in a society or community. In Ghana, institutions comprise:

- Policies
- Strategies
- Legal frameworks
- Guidelines and principles
- Procedures
- Standards, norms and traditions
- Organizations

12. Organizations can be public bodies, semi-public corporations, community or private organizations, depending on the character of the rules that they are supposed to follow.

13. Institutions in Ghana involved in the water sector can be categorized into:

- principal sector agencies, that deal with direct facilitation and implementations; and
- allied sector agencies that play supporting roles including regulation and over-sight.

2.1 Relevant Institutions in Ghana Involved or likely to be involved

14. Institutional structures and legal frameworks have been established to some degree in the riparian countries for environmental management. The Legal instruments establishing new institutions and strengthening existing ones for managing water resources in Ghana, and in particular the Volta Basin are summarized in Table 1. The detailed functions and mandates of the institutions, analysed in section 3.2, are defined in the Acts establishing them.

Table 1. Public Laws and Acts Establishing the Relevant Institutions in the Water Sector

Legal Instruments	Institution
The Principal Sector Agencies and Departments	
Civil Service Law, 1993 (PNDCL 327) established the various Ministries and their Departments	• Ministry of Water Resources, Works and Housing (MWRWH) • Ministry of Local Government and Rural Development (MLGRD) • Ministry of Food and Agriculture (MoFA) • Ministry of Fisheries • Ministry of Education, Youth and Sports • Ministry of Harbours and Railways • Ministry of Energy • Ministry of Health • Ministry of Lands, Forestry and Mines (MLFM)
Water Resources Commission Act, 1996 (Act 522)	Water Resources Commission (WRC) under the MWRWH
Ghana Water Company Limited (GWCL) Act, 1999 (Act 461)	Ghana Water Company Limited (GWCL) under the MWRWH
Community Water and Sanitation Agency (CWSA) Act, 1998 (Act 564)	Community Water and Sanitation of the MWRWH
Local Government Act, 1993 (Act 462)	Metropolitan and Municipal Authorities and District Assemblies
Ghana Irrigation Development Authority (GIDA), 1977 (SMCD 85); Regulations 1987 (L.I. 1350)	Ghana Irrigation Development Authority (GIDA) under MoFA
The Allied Institutions	
The Public Utilities Regulatory Commission (PURC) Act, 1997 (Act 538)	The Public Utilities Regulatory Commission (PURC)
The Environmental Protection Agency (EPA) Act, 1994 (Act 490); Regulations 1999 (L.I. 1652)	The Environmental Protection Agency
	The Ghana Standard Board
	The Town and Country Planning
	The Ministry of Finance and Economic Planning (MoFEP)
	The Ministry of Women and Children Affairs (MOWAC)
Council for Scientific and Industrial Research (CSIR); CSIR 1996 (Act 521)	Establishes the Council for Scientific and Industrial Research (CSIR)
Volta River Authority (VRA) VRA 1961 (Act 46)	Sets up Volta River Authority
	Water Resources Information Services (WRIS)
	Water Research Institute
	Ghana Meteorological Agency
	Hydrological Services Department
	International Water Management Institute (IWMI)
	Kwame Nkrumah University of Science and Technology (KNUST)
	University for Development Studies (UDS)
	University of Ghana
	Parliamentary Committee on Works and Housing and Parliament of Ghana
	Association of Water and Sanitation Development Boards (AWSDB)
	Regional Water and Sanitation Teams (RWSTs)
	Chiefs
	District Water and Sanitation Teams (DWSTs)
	Water and Sanitation Committees (WATSANs)
	Water and Sanitation Development Boards (WSDBs)

	Water Users Association
	Coalition of NGOs in Water and Sanitation (CONIWAS)
	Association of Water and Sanitation Development Boards (AWSDB)

2.2 Main Activities, Mandates, Institutional Frameworks and SWOT Analysis

15. An overview of the major institutions and actors involved or likely to be involved in the implemetation of the GEF-Volta Project is presented in Figure 1 (adapted from Fuest et al. 2005). The detailed description of their mandates activities and institutional frameworks are presented in Annex C and summarized in Table 2. The institutions and actors in the water sector are endowed with varying Strengths, Weaknesses, Opportunities and Threats (SWOT) relative to the implementation of the GEF-Volta Project. The SWOT analysis of these institutions is presented in Table 3.

16. Furthermore the matrix of institutional analysis is developed to show the magnitude of involvement of the institutions in the various components of water resources management and related natural resources such as surface water, groundwater, waste water, land management, soil management and integrated water resources manamgement. The matrix is presented in Annex D.

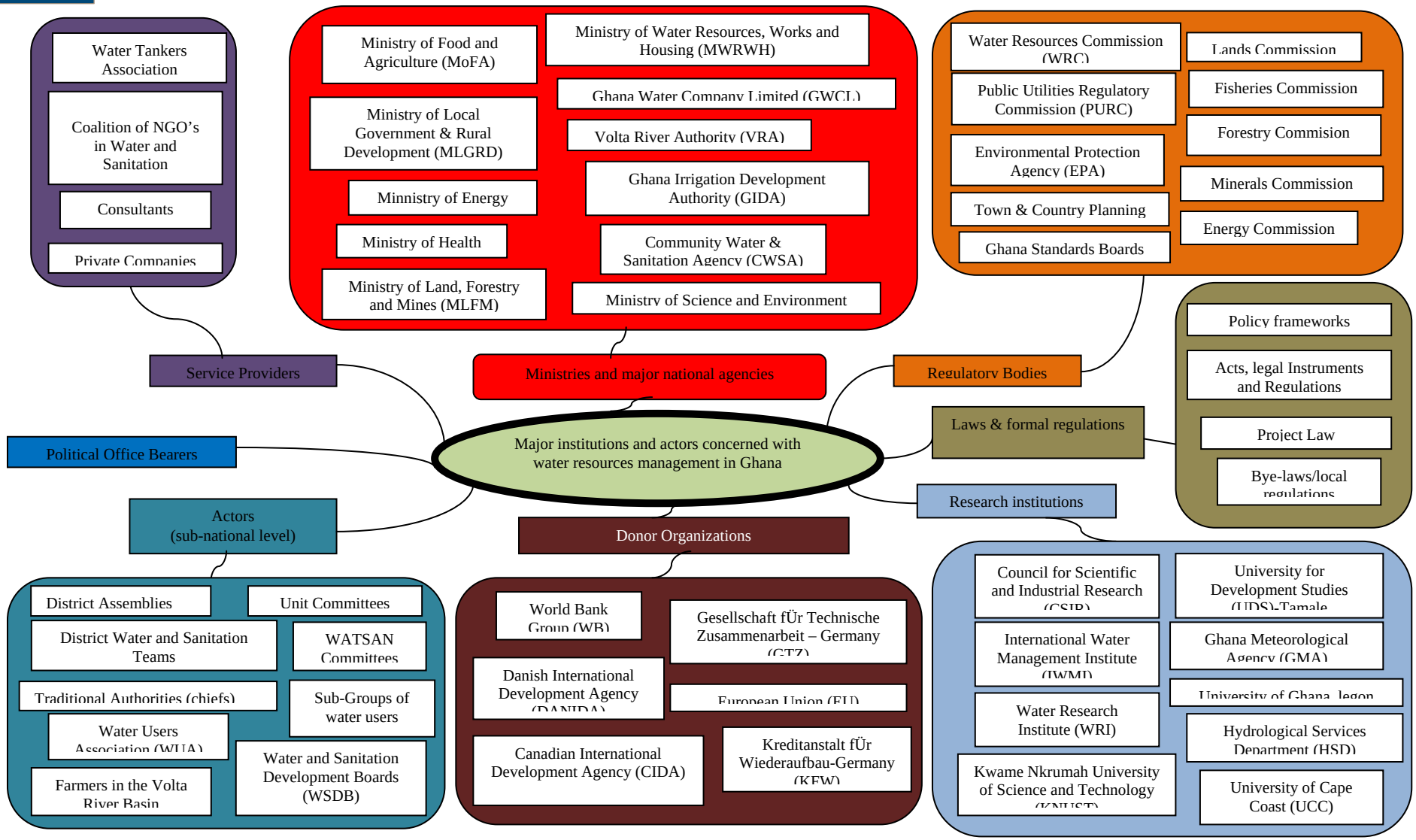

Figure 1: Major institutions and actors involved or likely to be involved in the implemetation of the GEF-Volta Project

Table 2: Overview of the Main Activities, Mandates and Institutional Frameworks of the Relevant National Institutions

Institution	Mandate	Activities/Functions
1. The Ministry of Water Resources, Works and Housing (MWRWH)	Legal government institution responsible for water. Focus on overall water resources management and drinking water supply	Overall policy formation, planning, coordination, collaboration, monitoring and evaluation of programmes for water supply and sanitation
1.1 Water Resources Commission	Regulation and management of Ghana's water resources and coordination of government policies in relation to them	• Coordinate the water sector with special regard to development agencies and exchange of data between relevant institutions • Integrate all stakeholders in the water sector • Guarantee access for safe drinking water and sanitation • Improve cooperation with Public Utilities Regulatory Commission
1.2 Ghana Water Company Limited (GWCL)	Responsible for overall planning, managing and implementation of urban water supply	Produce portable water at various headworks/treatment plants; transmission of water to tanks and reservoirs and distribution of water to customers through pipelines
1.3 Hydrological Services Department (HSD)	Responsible for hydrological data collection on surface water	Operate the national hydrometric data network on stream flows and sediment transport for water resources management
1.4 Community Water and Sanitation (CWSA)	Responsible for external liaison and coordination of the National Community Water and Sanitation Programme (NCWSP)	Overall management, planning, budgeting, resource mobilisation and coordination of rural water and sanitation projects
	Good governance and balanced development of metropolitan/municipal/district areas and ensure environment protection	• Improve the capacities of communities and local government institutions to mobilize and manage resources for accelerated rural and urban development • Promote community based registration, collation, analysis and publication of data on all births and deaths in Ghana • Promote human development and sustain the orderly and healthy growth of rural and urban settlements • Monitor and evaluate the effectiveness of local government institutions for improved management performance
3. The District Assembly (DA)	Statutory deliberative and legislative body of government responsible for the determination of broad policy objectives of the development process	• Planning, implementation, operation and maintenance of water and sanitation facilities • Overall development of districts • Formulate and execute plans, programmes and strategies for effective mobilization of resources necessary for overall development • Promote and support productive activity and social development in the district and prevent obstacles to initiative and development • Initiate programmes for the development of basic infrastructure and provide municipal works and services in districts • Development, improvement and management of human settlements and the

Institution	Mandate	Activities/Functions
		environment • Maintenance of security and public safety
4. Ministry of Food and Agriculture (MoFA)	Development and growth of Agriculture in the country	• Ensure food self sufficiency, production of raw materials for industry and increased foreign exchange earnings through diversification of export crops • Promote sustainable management of land and water resources for enhanced productivity • Disseminate improved technologies for agricultural production to stakeholders in the agricultural sector • Promotes research for development in agriculture • Integration of sustainable land management principles into sector policies
5. Ghana Irrigation Development Authority (GIDA)	Formulate and execute plans to promote the sustainable development of the water resources of the country for farmers, agro-related industries and institutions in the areas of irrigation, livestock development and fish pond culture within environmentally conducive atmosphere	• Provision of efficient technical services in irrigation and support infrastructure for soil and water conservation measures • Assistance of farmers in technology transfer for irrigated agriculture • Provision of consultancy services in irrigation, aquaculture, stock water and soil conservation • Support for the maintenance and operation of irrigation systems such as tubewell, drip, sprinkler and simple infrastructure aimed at conserving water and soil moisture • Gather data and monitor information in the organization to facilitate decision making • Provision of dams to serve as sources of water for domestic supply in many rural communities
6. Ministry of Environemt and Science (MES)	Has ministerial responsibility for the integration environment and science and technology policies for the country's sectoral, structural and socio-economic planning.	• Supervises a number of agencies including the EPA which a regulatory, education and enforcement agency and WRI which focuses on research and information management
7. Ministry of Energy	Responsible for water-for-energy	Regulate the provision of hydro-power including its distribution
8. Ministry of Health	Responsible for policy formulation	Implements plans and programmes to improve the health of the people of the nation
9. Ministry of Land, Forestry and Mines (MLFM)	Sustainable management and utilization of Ghana's lands, forests, wildlife and mineral resources	Policy formulation, monitoring and evaluation
9.1 Forestry Commission (FC)	Regulation of the utilization of forest and wildlife resources as well as its conservation, restoration, management	• Manage the nation's forest reserves and protected areas • Assist the private sector and other agencies in the implementation of forest and wildlife policies

Institution	Mandate	Activities/Functions
	and development through planning, implementation, monitoring and evaluation	• Undertake the development of forest plantations for the restoration of degraded forest areas • Develop the forest plantations for the restoration of degraded forest areas • Expand the country's forest cover and increase in the production of industrial timber
9.2 Minerals Commission (MC)	Foster the efficient and effective regulation and management of the utilization of Ghana's mineral resources	• Prepare mining licenses • Sell data and information to mining companies • Act as one-stop-shop for investors • Monitor concession areas allocated • Register small-scale miners • Divert water for mining or other industrial purposes
10. Environmental Protection Agency (EPA)	Protection of water resources and the regulation of activities within catchment areas	• Policy and environmental standards' formulation • Planning and data collection • Promotion of environmental governance through the issuance of permits • Undertake awareness raising activities Coordination of activities of local and international agencies and institution and the realization of environmental impact assessment for activities potentially degrading the ecosystem • Facilitates mainstreaming of Strategic Environmental Assessment (SEA) into sector policies • Coordinates, manage and monitor all National Action Programmes to Combat Drought and Desertification (NAP) projects at the National and decentralized levels
11. Water Research Institute (WRI)	Generate appropriate technologies responsive to the private sector and socio-economic development	Generate, analyze and disseminate reliable information on the water resources of Ghana
12. Ghana Meteorological Agency (GMA)	Provision of meteorological information	Collect, process, archive and disseminate meteorological information to end users
13. Council for Scientific and Industrial Research (CSIR)	Pursue the implementation of government policies in scientific research and development	• Encourage coordinated employment of scientific research for the management, utilization and conservation of natural resources • Coordinate all aspects of scientific research • Undertake or collaborate in the collation, publication and dissemination of research results • Encourage and promote the commercialization of research results • Encourage the training of scientific personnel and research workers through the provision of grants and fellowships etc

Institution	Mandate	Activities/Functions
14. International Water Management Institute (IWMI)	Improve water and land resources management for food, livelihoods and nature	• Identify issues related to water management and food security that need to be understood and addressed by governments and policy makers • Develop, test and promote management practices and tools to mange water and land resources more effectively, and address water scarcity issues • Clarify the link between poverty and access to water so that government and research communities better understand the specific-water-related problems of the poor • Help developing countries build their research capacities to better deal with water scarcity and related food security issues
15. The Public Utilities Regulatory Commission	Regulate and oversee the provision of utility – electricity and water services in the country	Regulate the standard of services including the quality of water provided by GWCL and also tariff set for urban water supply
16. Ghana Standards Board	Responsible for developing and setting standards for various communities	Develop and set quality standards for drinking water including certification and other related uses
17. Town and Country Planning	Support District Assemblies in physical planning of towns	Provision of layout of towns that give land-use and directs developments services like roads, drainage networks, electricity and water supply distribution lines
18. Association of Water and Sanitation Development Boards (AWSDB)	An umbrella organization of WSDBs in the three northern regions of Ghana	• Guide communities to make informed decisions regarding water and sanitation needs in line with the national community water and sanitation strategy • Facilitate the formation of WATSANs, WSDBs, dam management committees • Development of training materials for the training of WATSANs • Training of WATSANs on financial management and bookkeeping, operation, maintenance of hand pumps, health and hygiene education and community development activities and WSDBs on the use of participatory methodologies, community entry and mobilization, group formation and dynamics, watershed management, pump operation, maintenance and repair, dam site selection, design and construction
19. Universities	Provide higher education and train the requisite manpower for the technological and socio-economic development of the country	Main activities are teaching, carry out research and extension of knowledge
20. District Water and Sanitation Teams (DWSTs)	In charge of water and sanitation issues	Form, train and supervise WATSANs through DWSBs
21. Water and Sanitation Committees (WATSANs)	Manage point water sources and oversee household latrine maintenance and hygiene promotion	Promote and maintain water infrastructure and to create the necessary revenue to cater for repairs and the procurement of spare parts

Institution	Mandate	Activities/Functions
22. Water and Sanitation Development Boards (WSDBs)	Represent community aspirations and interests during subprojects' planning and implementation	Manage rural/small urban water facilities
23. Water Users Association (WUA)	Community-based association formed with common interest to manage water use	• Operate and maintain dams • Allocate land to its members • Collect water fees • Provide agricultural services to its members
24. Coalition of NGOs in Water and Sanitation (CONIWAS)	Act as a link between its members and the government agencies involved in the provision of water and sanitation services	• Present one voice of NGOs in the water and sanitation sub-sector • Improve coordination and networking among NGOs and CBOs engaged in the water sub-sector
25. Farming communities in the Volta River Basin	Form the majority of the electorate and the main land users in the Volta River Basin	• Participate in government by voting in general elections and electing District Assembly members • Use slash and burn land clearing system to farm • Cultivate and irrigate vegetables along river banks • Apply various agro-chemicals in their farm enterprise • Graze and water their livestock • Fish in the river using unorthodox methods (agro-chemicals) in some cases • Harvest fuelwood and produce charcoal
26. Chiefs	In the traditional setting, the chief is the custodian of the land including all its related natural resources such as water	• They allocate land to their subjects • They exercise regulatory functions for the protection of waterbodies, sacred grooves etc. • They also settle issues related to land tenure in their areas of jurisdiction

Table 3. SWOT Analysis of Institutions and Actors involved or likely to be involved in the GEF-Volta Project

	Institutions	STRENGTHS	OPPORTUNITIES	WEAKNESSES	THREATS
Ministries	The Ministry of Water Resources, Works and Housing (MWRWH) Ministry of Environment and Science Ministry of Local Government and Rural Development Ministry of Food and Agriculture (MoFA) Ministry of Energy Ministry of Health Ministry of Land, Forestry and Mines (MLFM)	1. All the Ministries are established by law and acts which gives the legal backing and specific mandates to operate in the country 2. Responsible for the formulation of policies and implementation of projects 3. Oversight responsibility for specific agencies and departments with direct or indirect roles in the integrated management, sustainable development and protection of water and other natural resources of the Volta River Basin	1. Could benefit from training of their staff in River Basin Management and Integrated Water Resources Management.	1. Inadequate trained manpower in water resources management at all levels 2. Funding, infrastructure and logistics are inadequate 3. Motivation is low with respect to salaries and allowances	1. Change of Government 2. Adverse trends in global financing
Major National Agencies	Volta River Authority (VRA) Ghana Water Company Limited (GWCL) Ghana Irrigation Development Authority (GIDA) Community Water and Sanitation (CWSA) The Public Utilities Regulatory Commission (PURC) Lands Commission (LC) Environmental Protection Agency (EPA) Ghana Standards Board (GSB) Minerals Commission (MC) Energy Commission (EC) Forestry Commission (FC) Town and Country Planning Fisheries Commission	1. Mandated to construct and maintain water and irrigation infrastructure. 2. Responsible for quantification, allocation and distribution of water hence are involved in the overall planning, management and implementation of water-related projects	1. Could benefit from training of their staff in River Basin Management and Integrated Water Resources Management 2. Have external support to carry out their activities	1. Inadequate funding; infrastructure and logistics to carry out their functions 2. Weak enforcement of regulations on protection of environment and natural resources 3. Inadequate trained manpower in water resources management 4. low motivation for staff to work because of poor remuneration	1. Reduced budget from government due to shifts in government priorities 2. Brain-drain due to economic crisis in the country 3. Privatisation of public utilities

	Institutions	STRENGTHS	OPPORTUNITIES	WEAKNESSES	THREATS
Actors at the sub-national level	The District Assembly (DA) District Water and Sanitation Teams (DWSTs) Water and Sanitation Committees (WATSANs) Association of Water and Sanitation Development Boards (AWSDB) Water and Sanitation Development Boards (WSDBs) Water Users Association (WUA) Chiefs and Traditional Authorities Farmers in the Volta River Basin	1. Are directly involved with the stakeholders at the grassroots and responsible for the implementation of projects. 2. Plan, implement, operate and maintain water and sanitation facilities 3. District Assemblies, traditional authorities and chiefs are custodians of local environmental resources 4. Have invaluable indigenous knowledge 5. Have a wealth of experience in local conditions and customs	1. Obtain external funding for implementation of projects and provision of infrastructure 2. Could benefit from training of their staff in River Basin Management and Integrated Water Resources Management	1. Inadequate trained personnel to deal with transboundary river basin issues and integrated water resources management 2. Inadequate infrastructure and logistics to implement environmental regulations	1. Change of Government 2. Adverse trends in global financing 3. Inadequate decentralisation mechanisms such as financing

	Institutions	STRENGTHS	OPPORTUNITIES	WEAKNESSES	THREATS
Research Institutions	Water Research Institute (WRI) Ghana Meteorological Agency (GMA) Council for Scientific and Industrial Research (CSIR) International Water Management Institute (IWMI) Hydrological Services Department (HSD) Kwame Nkrumah University of Science and Technology University of Ghana, Legon University of Development Studies University of Cape Coast	1. Have highly specialised and trained personnel for water resources research 2. Manage data and develop models and decision support systems for planning, management, implementation and evaluation of water resources projects/systems 3. Assess the impact of climate change on quantity and quality of the Volta River 4. Generation appropriate technologies for sustainable natural resources management	1. Application of research outputs 2. Participatory and Collaborative research 3. External funding for research 4. Improvement of Infrastructure 5. Strengthened research capacity 6. Staff and student exchange programs 7. Participation in conferences, workshops and seminars for knowledge sharing	1. Inadequate equipment to carry out modern research 2. Poor remuneration and motivation for staff to do research	1. Reduced budget from government due to shifts in government priorities 2. Brain-drain due to economic crisis in the country
Service Providers	Coalition of NGOs in Water and Sanitation (CONIWAS) Consultants Water Tankers Association Private Companies	1. Have various expertises that could be tapped from 2. Well organised and close to the community level 3. Promote Popular Participation	1. Expanded service linkages 2. Could benefit from training of their staff in River Basin Management and Integrated Water Resources Management 3. Access to soft loans, grants and other external resources 4. Access to market intelligence	1. Are not flexible with their mandate	1. Change of Government 2. Adverse trends in global financing 3. Consumer dissatisfaction with service provision

	Institutions	STRENGTHS	OPPORTUNITIES	WEAKNESSES	THREATS
Donors	World Bank Group (WBG)	1. Fund and monitor projects 2. Are able to mobilise expertise	1. Carry out social responsibilities 2. Building of partnership through collaboration 3. Enhanced visibility	1. Are not flexible with their mandate	1. Change of Government 2. Adverse trends in global financing
	Danish International Development Agency (DANIDA)				
	Canadian International Agency (CIDA)				
	European Union (EU)				
	Geseltlschaft für Technische Zusammenarbeit - Germany (GTZ)				
	Kreditanstalt für Wiederaufbau - Germany (KFW)				

3 National Concerns, perceptions/reactions to transboundary issues

17. The detailed analysis of institutional mandates in the water sector in Ghana showed that many institutions are charged with the responsibilities of managing water and soil resources. This results in the overlapping of responsibilities and difficulties in coordination. Coordination of activities among the institutions was found to be generally weak, and in some cases is only on an *ad hoc* basis for crisis situations. In order for the management of water and soil resources to be effective, it should be integrated at the local and national level, with emphasis on intersectoral coordination.

18. The effectiveness of the laws governing resources poses another problem as the laws and regulations established for the management of water and soil resources appear to be weak and ineffective. In some instances, the laws are adequate but they are not adhered to or enforced either due to lack of institutional capacity or political commitment. The knowledge base of the state of natural resources, rate of depletion, and consequent future impact is poor, and probably contributes to the weak political commitment on the part of government and apparent apathy on the part of the populace. Similarly with the exception of a few of the Institutions such as WRC, IWMI, UG, KNUST, WRI and the HSD the knowledge base of all potential stakeholders in Ghana with regards to the GEF-Volta Project was poor. They had not heard of the project or they do not know much about it. However interactions with them showed that they shared the objectives of the GEF-Volta project and the expected outputs. They also showed willingness to collaborate with the project. They however emphasized the need for training to enable them play active roles particulary in the area of IWRM/IRBM.

4 Development of Training Plan for National Institutions

19. The institutional analysis showed that non-research institutions needed to train their staff on Integrated Water Resources and River Basin Management through refresher/short courses. Even most of these institutions were under-staffed.

20. The Research Institutions and the Universities do some research in Integrated Water Resources Management but it was only KNUST that organised a postgraduate program and short courses in Water Resources Management. These short courses could be tailor-made. The modules for the program can be found in Annex E . They also collaborate with Cap-Net and so use most of their training manuals in their programs.

4.1 Assessment of national institutions' capacities to address IRB issues

21. The major constraints confronting the capacities of national institutions to address International River Basin issues include but not limited to inadequate:

- Staff numbers to cater for the diverse but interrelated aspects of IRB management
- Skills related to the various water management functions at all levels
- Technical, managerial and planning expertise in the water sector
- Public awareness and understanding of IRB issues
- Appropriate tools and resources
- Participatory mechanisms in addressing IRB management issues

4.2 Prioritized Training Gaps at National and Local Levels

22. In the context of the objectives and on-going and planned initiatives of the GEF-Volta Project, the following knowledge gaps requiring training both at the national and local levels are identified:

- Integrated Water Resources Management
- Water Resources Planning
- Watershed and River Basin Management
- Ecosystem functions and management
- Water resources assessment, development and management
- Community-based participatory watershed development planning
- Raising awareness for IWRM

4.3 Outline of the prioritized training needs

- Integrated Water Resources Management
- Water Resources Planning
- Watershed and River Basin Management
- Community-based participatory watershed development planning
- Raising awareness for IWRM

4.3.1 Integrated Water Resources Management

23. **Learning Objectives:** To familiarize professionals with the latest insight, context and concepts in integrated water resources management, that are under debate in international fora and in different parts of the world. On conclusion of the module, the participant will have an integrated view of the field of water resources management and the main issues of debate, including: water as an economic good, the role of the government, the role of the private sector, demand management, the role of water pricing, water for sustainable development, institutional arrangements, etc.

4.3.2 Water Resource Planning

24. **Learning Objectives:** Participants will be able to evaluate, participate in and guide water resources planning activities applying planning techniques and water resources system analytical methodologies. Participants will be acquainted with the economic concepts of water resources planning and communicate with economists on the issues involved.

4.3.3 Watershed and River Basin Management

25. **Learning objectives:** In this module the participants will:

- Describe the main natural and human elements and their interactions at a watershed scale.
- Be familiar with the role of water in sustaining different land uses, including ecosystems, at a watershed scale
- Be familiar with management of soil and water at the watershed scale and with planning approaches and methodologies for watershed planning
- Construct a simple water balance for different land use systems at the watershed scale, and ad water system innovations
- Be able to assess consequences of human interventions in watersheds at the river basin scale.

4.3.4 Community-based participatory watershed development planning

26. The execution of the GEF-Volta Project Demo Project at the community level in Ghana would require equipping the lead agency implementing the project with the principles and concepts of participatory watershed development planning.

27. **The overall objective** of participatory watershed development watershed development is to improve the livelihood of rural communities/households through comprehensive and integrated natural resource development.

28. More specific objectives include:

- Conserving soil, rainwater and vegetation effectively for productive uses
- Harvesting surplus water to create water sources in addition to ground water recharge
- Promoting sustainable farming and stabilize crop yields by adopting suitable soil, water, nutrient and crop management practices
- Rehabilitating and reclaim marginal lands through appropriate conservation measures and mix of trees, shrubs and grasses, based on land potential
- Enhancing the income of individuals by the diversified agriculture produce, increased employment opportunities and cottage enterprises, particularly for the most vulnerable, linked to the sustained use of natural resources.

29. Participatory watershed development

- Principles of watershed development
- Size of the watershed
- Watershed and sub-watersheds – linkages and intervention logic
- Elements and characteristics of watershed (biophysical and socio-economic)

30. Watershed degradation features

- Depletion of water resources
- Soil erosion and land degradation
- Degradation of vegetative cover
- Damage to infrastructure

31. Existing untapped potentials for optimizing use of water and soil in a watershed

- Water harvesting
- Land rehabilitation, reclamation and productivity enhancement
- Protection, development and sustainable management of forest
- Sustained, long lasting and effective use of rural infrastructure
- Promotion of income generation activities
- Watershed development and conflict resolution

4.3.5 Raising Awareness for IWRM

32. Confronting challenges to the water sector requires a change in the way water is managed. Business-as-usual scenarios are no longer appropriate and the whole sector has to resort to integrated water management. A comprehensive understanding and a great deal of awareness of IWRM approaches has to be inherent to all sectors of society and government. This will ultimately lead to changes in public attitudes when dealing with water resources, changes in management practices, more valuing of water and its ethics, and more participation and involvement in preserving and efficiently utilizing the national and transboundary water resources.

33. A national programme will be formulated to coordinate and steer the efforts for raising awareness for IWRM. The programme will target all groups belonging to the water sector whether from governmental entities or from the civil society. The programme will aim at providing the stakeholders (NGOs, farmers, WUA, Governmental Officials, Investors etc) with IWRM principles, approaches and benefits and motivate the efficient and effective participation in decisions and actions concerning satisfactory water related services.

34. Tailored awareness programmes for each target group containing the proposed methodology; tools, key players and activities will be formulated. A system for monitoring of performance and success indicators will be developed and applied for M&E of the IWRM awareness programme. The tools to be adopted and used for information dissemination and awareness include:

- Personal communication (seminars, small group discussions including district engineers and farmers, communication with stakeholders etc)
- Mass media means such as TV and radio channels
- Field visits and discussion forums
- Websites on the internet
- Documentary films illustrating the different challenges facing the water sector and how to tackle them
- Public seminars on national and regional scales

4.4 Plan of Operation for Training of National Institutions on IRB Management

35. In operationalizing the training of national institutions on IRB management, it is proposed that a Technical Secretariat be established at the Water Resources Commission under the Ministry of Water Resources, Works and Housing. The mandate for the Technical Unit will include organizing the training programmes/modules into Operational Plans ready for implementation or project documents seeking funding, dissemination of the training plan, coordination and communication among various stakeholders pertaining to different interventions, documentation, periodical review and adjustments to the plan.

36. The training programmes will be tailored to the needs of specific stakeholder groups involved in the water sector bringing together the expertise and experience of local and international organizations. These programmes can help, depending on the stakeholder groups targeted, to raise environmental awareness, improve technical skills and provide facilities and equipments to support integrated natural resource management activities. Training priorities for stakeholder groups may include the following:

- *National and local economic and development planners:* formal training (in-service training, in-country and overseas courses, and staff exchange) on the sustainable management of renewable natural resources, the economic valuation of natural resources, and the use of market-based instruments in natural resources management.
- *Resource owners such as government entities, local communities, individuals and private firms*: Environmental awareness programs on sustainable resource management principles (both workshops and seminars, as well as public service announcements on radio and television, and community theater).
- *Resource managers such as government and private sector employees and local communities*: Systematic formal training, based on country needs, through in-service training, in-country and overseas courses, and staff exchange among developing countries and between developing countries and developed countries. Training priorities may include natural resource assessment; development and implementation of environmental policies, regulations and standards; community-based natural resource management; stakeholder communication; conflict prevention and management; sectoral environmental assessment; economic valuation of natural resources; and use of market-based instruments in natural resource management.
- *Resource users such as government agencies, local communities, and the private sector*: Training on environmentally sound technologies and sustainable farming and fishing systems, as well as providing information on alternative livelihoods that could reduce pressure on land and water resources and on microcredit schemes to facilitate the adoption of such livelihoods.

5 Collaboration with Ongoing/Planned Initiatives

37. In order to develop collaboration plan between the GEF-Volta Project and the national institutions and ongoing and planned initiatives in the basin, a matrix was developed matching the thematic areas of the GEF-Volta Project with the level of involvement of the institutions and links with ongoing/planned initiatives. The matrix (Table 4) pin-points potential areas and activities in which collaboration can be developed.

38. The ongoing projects include GLOWA-Volta, Volta HYCOS, IUCN/PAGEV and CGIAR-CPWF. The description of these projects and their links with the GEF-Volta Project is presented in UNEP-GEF Volta Project (Inception Report, 2008). The planned projects in the basin which have potential links with the GEF-Volta Project involve the use of the volta river for hydropower generation and irrigation. These include the Bui on the Black Volta and the Pwalugu on the White Volta. The catchment area of the Bui hydropower project, which is already under construction , is 148820 km^2 with a hydropower potential of 400MW and annual energy generation of 1000GWh. The corresponding figures for Pwalugu by 2020 are 105540 km^2, 50MW and 184GWh. The Bui project falls within the GEF-Volta Demo Project 3 which has overall objective of sustainability of water resources in the Black Volta Basin (Côte D'Ivoire and Ghana) through participative campaigns of reforestation.

39. Planned irrigation projects in Ghana include: 15000 ha of sugarcane by the Ghana Sugar Development Company in the northern Ghana part of the White Volta Basin near Tamale at Dinga drawing water from the White Volta River upstream of Nawuni at 18 m^3/s. The company is to construct a weir on the Nasia River to supply water deficit over low flow months. Other potential irrigation projects related to various hydroelectric projects are: 30000-62000 ha for the Bui Hydroelectric Project using the Black Volta as the water source; 92000-110000 ha for the Pwalugu Hydroelectric Project on the White Volta.

40. **The implementation of the collaboration plan** will involve the use of consultative tools such as workshops, seminars, meetings and advocacy platforms to create awareness on the need for collaborative effort in the sustainable management of water and land resources of the Volta basin. The Focal Points and the Forum of Stakeholders of the Volta Basin Authority (VBA) can play a major role in this effort. Other processes of collaboration may include the formation of stakeholder committees particularly at the District and Community levels to spearhead joint action and the establishment of agreements (e.g. Memoranda of Understanding) with the identified institutions or projects with assigned roles and responsibilities.

41. To sustain collaboration, a joint strategy for implementation and monitoring plan should be developed with the active participation of identified partners and stakeholders in the planning and decision making processes. Addressing the views and concerns of each partner in joint forum aids in overcoming inequities and can pre-empt ojections that might be raised in a more adversarial forum if active involvement occurs too late.

Table 4. Collaboration Plan of Institutions and Ongoing/Planned Initiatives with the GEF Project

	Key Actors	Thematic Areas													
		Development of Early Warning Systems				Waste Water Treatment			Catchment Protection						
		Collection and processing of Hydrological data	Collection and processing of Meteorological data	Development of Hydrological Models	Capacity building on Flood & Drought management	Develop Models	Capacity building	Awareness creation	Awareness creation	Training in RBM	Control of Erosion	Reforestation	Land and Water Mgt	Ecosystem protection	Land reclaimation
Major National Agencies	Volta River Authority (VRA)	x	x	o	o	o	o	o	x	o	0	o	x	o	o
	Ghana Water Company Limited (GWCL)	x	o	o	o	o	o	x	x	o	o	o	x	o	o
	Ghana Irrigation Development Authority (GIDA)	x	x	o	o	o	o	o	x	o	x	x	x	x	o
	Environment and Land Management Unit under MoFA	x	x	o	o	o	o	x	x	o	x	x	x	x	x
	Community Water and Sanitation (CWSA)	x	x	o	x	o	x	x	x	o	o	o	o	o	o
Regulatory Bodies	Water Resources Commission (WRC)	o	o	o	x	o	o	x	x	x	x	x	x	x	o
	Lands Commission (LC)	o	o	o	o	o	o	o	o	o	o	o	x	o	o
	Environmental Protection Agency (EPA)	o	o	o	x	o	x	x	x	o	x	x	x	x	x
	Minerals Commission (MC)	o	o	o	o	o	o	x	o	o	o	o	o	o	x
	Energy Commission (EC)	x	x	o	x	o	o	o	x	o	o	o	o	o	o
	Forestry Commission (FC)	o	x	o	x	o	o	o	x	o	x	x	x	x	x
	Town and Country Planning	o	o	o	o	o	o	x	x	o	o	o	o	x	x
Actors at the sub-national level	The District Assembly (DA)	o	o	o	x	o	x	x	x	o	x	x	x	x	x
	District Water and Sanitation Teams (DWSTs)	o	o	o	o	o	o	x	x	o	o	o	o	x	o
	Water and Sanitation Committees (WATSANs)	o	o	o	o	o	o	x	x	o	o	o	o	x	o
	Association of Water and Sanitation Development Boards (AWSDB)	o	o	o	o	o	o	x	x	x	x	x	x	x	x
	Water and Sanitation Development Boards (WSDBs)	o	o	o	o	o	o	x	x	o	x	x	x	x	o
	Water Users Association (WUA)	o	o	o	o	o	o	o	x	o	x	x	x	x	o
	Farmers in the Volta River Basin	o	o	o	o	o	o	o	o	o	x	x	x	x	x

	Key Actors	Thematic Areas													
		Developmnet of Early Warning Systems				Waste Water Treatment			Catchment Protection						
		Collection and processing of Hydrological data	Collection and processing of Meteorological data	Development of Hydrological Models	Capacity building on Flood & Drought management	Develop Models	Capacity building	Awareness creation	Awareness creation	Training in RBM	Control of Erosion	Reforestation	Land and Water Mgt	Ecosystem protection	Land reclaimation
Research Institutions	Water Research Institute (WRI)	x	x	x	x	x	x	x	x	o	x	x	x	x	o
	Ghana Meteorological Agency (GMA)	x	x	x	o	o	o	o	x	o	o	o	o	o	o
	Council for Scientific and Industrial Research (CSIR)	x	x	x	x	x	x	x	x	o	x	x	x	x	o
	International Water Management Institute (IWMI)	x	x	x	x	x	x	x	x	o	x	x	x	x	o
	Hydrological Services Department (HSD)	x	x	x	x	o	o	o	x	o	x	x	x	o	o
	Kwame Nkrumah University of Science and Technology	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	University of Ghana, Legon	x	x	x	x	x	x	x	x	o	x	x	x	x	x
	University of Development Studies	x	x	x	x	x	x	x	x	o	x	x	x	x	x
	University of Cape Coast	x	x	x	x	o	o	x	x	o	x	x	x	x	x
Service Providers	Coalition of NGOs in Water and Sanitation (CONIWAS)	o	o	o	o	o	o	x	x	o	x	x	x	x	x
	Consultants	o	o	x	x	x	x	x	x	o	x	x	x	x	x
	Private Companies	o	o	x	o	x	o	o	o	o	o	x	x	x	x
Projects in VBA	GLOWA-Volta	x	x	x	x	x	x	x	x	o	x	x	x	x	o
	CGIAR - CPWF	x	x	x	x	x	x	x	x	o	x	x	x	x	o
	IUCN/PAGEV Project	x	x	x	o	o	o	x	x	o	x	x	x	x	o
	GCI-Water for Peace Project	o	o	o	x	o	o	x	x	o	x	x	x	x	o
	Volta HYCOS Project	x	x	x	x	o	o	o	x	o	o	o	o	o	o
	Bui and Pwalugu Hydropower Project	x	x	o	x	o	o	o	x	x	x	x	x	x	o
	Irrigation Projects	x	x	o	x	o	x	x	x	x	x	x	x	x	o

Key x Involved o Not involved

6 Annexes

6.1 Annex A: Detailed terms of reference

Consultancy: Terms of Reference of the study relating to Analysis of National Institutions including ongoing/planned initiatives

Background

The UNEP/GEF Volta River Basin Project for "*Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area*" is a regional initiative of six riparian countries in the basin, including Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali and Togo. The project which has been designed to facilitate the integrated management, sustainable development and protection of natural resources of the Volta River Basin plan to achieve its objectives by addressing priority regional transboundary issues and problems as identified through a preliminary transboundary diagnostic analysis (TDA) earlier conducted on the basin. The project is expected to promote a more sectorally-coordinated management approach, based on Integrated Water Resource Management (IWRM) principles, both at the national and the regional levels, with a strong emphasis on an expanded role for all stakeholders.

The long-term goal of the project is to enhance the ability of the countries to plan and manage the Volta catchment areas within the territories and its aquatic resources and ecosystems on a sustainable basis.

This Project has three main components with associated objectives identified by the root cause analysis carried out during the project preparation process and updated during the inception phase as follows:

- Specific Objective n° 1: Build capacity, improve knowledge, enhance stakeholders involvement to support the effective management of the VRB
- Specific Objective n° 2: Develop river basin legal, regulatory and institutional frameworks and management instruments for addressing transboundary concerns in the Volta River Basin and its downstream coastal area
- Specific Objective n° 3: Demonstrate national and regional measures to combat transboundary environmental degradation in the Volta Basin

The project aims at contributing to regional integration, promoting coordination and dialogue among the riparian member countries and fostering the participation of the local populations and the stakeholders as far as the Volta River Basin resources are concerned. The project implementation shall lead to the formulation of a Strategic Action Programme (SAP) for the entire Volta River basin and contribute to the sustainable management of the basin.

In order to secure the strategic coherence of the actions and to efficiently implement the project, it is envisaged, under the Specific Objective n° 1, to enhance the capacity of national institutions on international river basin (IRB), identify, prepare and implement collaboration plan with ongoing/planned initiatives. It is under this framework that the present study is developed.

Activities

A team of 6 national experts to be selected by each of the riparian countries, and 1 regional expert to be selected on competitive basis by the Project Management Unit (PMU) will be contracted by UNOPS as Consultants to conduct a detailed analysis of national/regional institutions (including training gaps and training plan) and prepare a collaboration plan with ongoing and planned initiatives. In view of this, the consultants will work through the Project Management Unit (PMU) and National Project Coordinators to execute the following far-reaching assignments:

1. Detailed national/regional institutions analysis:

- Identify all relevant national and regional instructions established in each of the 6 riparian countries involved or likely to be involved in the implementation of the GEF Volta Project.
- Analyze the main activities, mandates, institutional frameworks, weakness and strength of national/regional institutions involved or likely to be involved in the implementation of the GEF Volta Project.
- Carry out national/regional institutions concerns, perceptions and reactions to transboundary issues and GEF-Volta project activities
- Identify national/regional institutions priorities and potential constraints

2. Development of training plan for national institutions, including:

- Assessment of national institutions capacities to address IRB issues
- Identification of training gaps at the national and local levels in relationship with the objectives and areas of the GEF Volta Project
- Prioritisation of training needs to address international river basin issues and effective national institutions participation in the project activities
- Development of plan of operation for Training of national institutions on IRB management
- Outline of the various information and learning manuals relating to IRB management and the training manuals required for the related activities.

3. Development of collaboration plan with ongoing/planned initiatives, including:

- Identify and analyse ongoing and planned initiatives in the region and their links with the GEF Volta-Project
- Identify GEF-Volta project activities where collaboration with ongoing/planned initiatives is needed
- Collaboration activities and tentative schedule based on GEF-Volta Project and identified initiatives work plans
- Strategy for the implementation of the collaboration plan including roles and responsibilities
- uidance for the tracking of the implementation of the collaboration plan
- Likely added value of the implementation of the collaboration plan
- Risks associated with insufficient or excessive collaboration with ongoing or planned initiatives

The regional expert will be responsible for leading and coordinating the consultancy, ensuring the quality of the national studies, synthesis of the national reports, and production of the final regional collaboration plan with ongoing/planned initiatives based upon the stated activities in the ToR.

The national experts will be responsible for national studies and production based upon the stated activities in the ToR of: i-) the report on the analysis of national/regional institutions and ongoing/planned initiatives and, ii-) the training plan for national institutions.

Key expected outputs of the consultancy

- Analysis of relevant national and regional instructions completed and approved by PMU and National Focal Points
- Capacity building needs of national institutions, identified, prioritised and plan of operation of training developed and approved
- Plan for collaboration with ongoing/planned initiatives developed and approved

Key Considerations for the study

The consultants shall propose a detailed methodology, sufficiently clear and enabling to achieve the objectives of the study and produce the expected outputs. To this effect, the information below is provided for an efficient orientation of the study.

The consultants shall take into consideration all on-going and planned initiatives, in the basin, in order to achieve the necessary synergies and complementarities at the level of the development of the contents of the plan for collaboration, training plans and their implementation.

The consultants are expected to maintain regular communication with the key regional/national institutions and liaise with the National Project Coordinators and other relevant groups of players. The very fact of involving national consultants is a necessity not only for taking into account the national specificities but also for developing the linkage and ownership by the national partners at the time of the implementation of the training and collaborations plans. PMU will make available all related literatures at its disposal and provide the consultants with contacts of key institutions involved or likely to be involved in the GEF-Volta project or Volta River Basin management.

Required expertise and qualifications of consultant

The assignment shall be conducted by a regional expert and 1 national expert each for the riparian countries with individual but extensive experiences of more than ten years in the areas of competence required by the study. Equally, the consultants must have conducted activities of similar nature and complexity, especially in the framework of other GEF financed projects.

The consultants' should have the following qualifications and experiences:

- Regional consultant: a higher degree in environmental/land resources management, communication, public policy or social science with considerable experience in institutional development, training and capacity building, development of collaboration plans.
- National consultant: a higher degree in environment related studies and competences in IWRM, capacity building, including working experience in institutional development.

Furthermore, the following qualifications shall be an asset

- Prior experience in the development of collaboration plans and programmes;
- Experience in the implementation of natural resources management and multi-stakeholder based development projects at the national and regional levels.
- Knowledge or experience in working on issues of governance, advocacy and participatory monitoring.
- Knowledge of GEF practices and procedures
- Working experience and production of documents in French and English

6.2 Annex B: List of persons contacted

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6.3 Annex C: Detailed description of national institutions, their mandates, activities and institutional frameworks

The Ministry of Water Resources, Works and Housing (MWRWH)

The MWRWH is the legal government institution responsible for water. Its main focus is on overall water resources management and drinking water supply, while other sector Ministries deal with sector-related uses, such as, irrigation under Ministry of Food and Agriculture (MoFA), fisheries, hydropower under Ministry of Energy and water transport under Ministry of Harbours and Railways.

The MWRWH is responsible for overall policy formulation, planning, coordination, collaboration, monitoring and evaluation of programmes for water supply and sanitation. The Water Directorate is the focal point for coordination of the water and water-related sanitation sector for policy harmonization, sector-wide monitoring of the Growth and Poverty Reduction Strategy (GPRS II) outcomes and the Millennium Development Goals (MDGs) targets as well as coordination of foreign assistance. The key agencies of MWRWH carrying out the Ministry's water resources management and drinking water programmes are the Water Resources Commission (WRC), Ghana Water Company Limited (GWCL) and Community Water and Sanitation Agency (CWSA).

Water Resources Commission

The WRC is responsible for the regulation and management of Ghana's water resources and coordination of government policies I relation to them. It provides the focal point in fostering coordination and collaboration among the various actors involved in the water resources sector.
The vision of the WRC is to "promote an efficient and effective management system for an environmentally sound development of all water resources in Ghana, to assure full socio-economic benefits for the present and future generations.
More specifically, the functions of the WRC are to:

i. Coordinate the water sector with special regard to development agencies and exchange of data between the relevant institutions;

ii. Work toward the integration of all stakeholders in the sector, while respecting traditional norms and customs;

iii. Guarantee access to safe drinking water and sanitation; and

iv. Improve cooperation with Public Utilities Regulatory Commission which supervises water pricing.

In principle, there is no private ownership of water in Ghana, but the President of Ghana, or anyone so authorized by him, may grant rights for water use. The WRC Act provides for certain categories of water uses which are exempted from the requirement of prior permit. For example, Section 13 (2) of the WRC Act provides for the use of water resources for the purpose of fighting fire, while Section (14) states that "a person who has access to water resources may abstract and use such water for domestic purposes.

The WRC has a mandate for standards and regulation for water uses and services. The WRC Act, 1996 (Act 552) confers on the Water Resources Commission the mandate to enact regulations on water use.
The Water Use Regulation, 2001 (L.I. 1692) provides procedures for allocating permits for various water uses including domestic, commercial, municipal, industrial, agricultural, power generation, water transportation, fisheries (aquaculture), environmental and under water (wood) harvesting. It also sets the modalities of administrative fees as well as raw water charges. Exemptions from the duty to obtain permits include, water abstracted by manual means or by mechanical means where abstraction levels do not exceed 5 l/s, subsistence water use for land areas not exceeding 1 ha and subsistence aquaculture water use not exceeding 1 ha.

At the central level, the WRC is governed by a Secretariat headed by an Executive Secretary and has four line departments: Planning Department; Finance and Administration; Policy, Regulation and Monitoring and Information Department.

At the field level, the WRC has a Basin Office at Bolgatanga run by a Basin Officer for the whole of the White Volta Basin. Among the institutions that the Commission collaborates with on issues as may relate to their mandate or operations are: Environmental Protection Agency (EPA), Hydrological Services Department (HSD), Ghana Meteorological Agency (GMA), Municipal and District Assemblies, FAO Oncho Transborder Project and some Non-Governmental Organizations (NGOs).

The Ghana Water Company Limited (GWCL)

The GWCL is responsible for overall planning, management and implementation of urban water supply.

The Community Water and Sanitation (CWSA)

The CWSA of the MWRWH emerged from the Community and Water Sanitation Division of the Ghana Water and Sewerage Corporation (GWSC). The CWSA is responsible for the overall, management, planning, budgeting, resource mobilization and coordination of rural water and sanitation projects. It is responsible for external liaison and coordination of the National Community Water and Sanitation Programme (NCWSP). As the focal point of rural water supply CWSA collaborates with several donor organizations including DANIDA, World Bank, GTZ, EU and AFD, represents organizations producing portable water in the WRC.

The Ministry of Local Government and Rural Development (MLGRDE)

The MLGRD is responsible for ensuring good governance and balanced development of metropolitan/municipal/district areas through the formulation of policies in decentralizing, rural development and environment.
It is responsible for implementing the Environmental Sanitation Policy including management and regulation of solid and liquid wastes by local government bodies, NGOs and private sector groups. It is responsible for ensuring effective communication between the involved agencies.

More specifically, its objectives are to:

i. Improve the capacity of communities and local government institutions to mobilize, and manage resources for accelerated rural and urban development;

ii. Promote community based registration, collation, analysis and publication of data on all births and deaths occurring in Ghana;

iii. Promote human development and sustain the orderly and healthy growth of rural and urban settlements in Ghana; and

iv. Monitor and evaluate the effectiveness of local government institutions for improved management performance.

The ongoing decentralization process could potentially provide strategic tools for embedding integrated land use planning and IWRM within communities and districts or to implement them as a decision of the District Assemblies (DAs).
The MLGRD holds the mandate for environmental protection and consequently EPA is subordinated to it.
The organizational structure at the central level presents four line directorates (Policy; Performance Management; Management Services and Planning; Budgeting, Monitoring and Evaluation) and a series of technical administrative units. From the variety of agencies, the ones potentially relevant to the GEF-Volta Project are Department of Parks and Gardens, The Town and Country Planning Department and the Environmental Sector Department.
In the performance of its function at the field level, the District Assembly works through the Executive Committee. This includes the Sectoral Services Sub-committee, Works Sub-committee, Finance Administration and Development Planning Sub-committee among others.

The District Assembly (DA)

The District Assembly is the basic unit of Government at the district level and is the statutory deliberative and legislative body for the determination of broad policy objectives of the development process within their jurisdictions. DAs are responsible for planning, implementation, operation and maintenance of water and sanitation facilities and the legal owners of communal infrastructures in rural communities and small towns.
The functions of the Das are:

- Be responsible for overall development of the district and ensure the preparation and submission through the regional coordinating council for approval of the development plan to the commission and budget to minister of finance for the district.

- Formulate and execute plans, programmes and strategies for the effective mobilization of the resources necessary for the overall development of the district.

- Promote and support productive activity and social development in the district and remove any obstacles to initiative and development.

- Initiate programmes for the development of basic infrastructure and provide municipal works and services in the districts.

- Be responsible for the development, improvement and management of human settlements and the environment in the district.
- In cooperation with appropriate national and local security agencies, be responsible for the maintenance of security and public safety in the district.
- Ensure ready access to the courts and public tribunals in the district for the promotion of justice.
- Initiate, sponsor or carry out studies as may be necessary for the discharge of any of the functions conferred y Law or any other enactment.

In the performance of its function, the DA works through the Executive Committee. This includes the Social Services Sub-Committee, Works Sub-Committee, Finance Administration and Development Planning Sub-Committee among others.

Ministry of Food and Agriculture (MoFA)

The MoFA is responsible for the development and growth of Agriculture in the country with exemption o f the Cocoa-Coffee and Forestry sectors.
Its main goals are: i) Food self sufficiency; ii) The production of raw materials for industry; and iii) Increased foreign exchange earnings through diversification of export crops.
MoFA is key to the GEF-Volta Project for two reasons: i) Agricultural practices are a main cause of land degradation; ii) Agriculture provides for most of the economic growth of the country, and iii) Water use through irrigation for agricultural production.
At the central level, MoFA is structured in technical and line directorates. The line directorates include:

- Finance and Administration
- Policy Planning
- Monitoring and Evaluation
- Human Resource Development and Management
- Statistics, Research, Information and Public Relations

Technical Directorates are:

- Crop Services
- Engineering Services
- Agricultural Extension Services
- Plant Protection and Regulatory Services
- Animal Production
- Veterinary Services

- Women in Food and Agriculture

Directorates are cost-centres at central level, i.e. they receive budget allocations from the Ministry and are entitled to authorize expenditures.
A Land and Water Management Unit (LWMU) exists under the Crops Services Directorate. The LWMU was created in the context of the Land and Water Management Project (LWMP), financed by DANIDA, with the function of training and raising awareness among MoFA's staff on sustainable land management (SLM) practices, and coordinating the realization of Village Land Development Plans by the regional and district MoFA offices.

- At the field level, each of the regions, has a Regional Directorate of Agriculture with subject offices reflecting the Directorate structure at the central level.

- Each region is subdivided administratively into districts, each with a District Department of Agriculture.

- Each district is subdivided into operational zones which are further subdivided into operational areas. Each zone is supervised by one district agricultural officer and each operational area by one agricultural extension agent (AEA). Most activity is carried out by the district offices, whilst regional offices are mainly charged with coordination and technical backstopping. An AEA is responsible for up to 14 farming communities.

The Ghana Irrigation Development Authority (GIDA)

GIDA under MoFA, was established in 1977 as a successor to the Land Planning Unit (1960), the Irrigation, Reclamation and Drainage Division (1964) and the Irrigation Department (1974). GIDA's mission is "to formulate and execute plans to promote the development, on a sustainable basis, the water resources of the country for farmers, agricultural related industries and institutions in the areas of irrigation, livestock development and pond fish culture within an environmentally conducive atmosphere.

GIDA provides efficient technical services in irrigation and support infrastructure for soil and water conservation measures. It assists farmers in technology transfer for irrigated agriculture and provides consultancy services in irrigation, aquaculture, stock water and soil conservation. GIDA provides support for the maintenance and operation of irrigation systems including tubewell, drip, sprinkler and simple infrastructure aimed at conserving water and soil moisture. It gathers data and monitors information in the organization to facilitate decision making. GIDA dams also serves as sources of water for domestic supplies in many rural communities.

The Ministry of Harbours and Railways

The Ministry is responsible for water transport and navigation and regulates activities within in-land and coastal territory of Ghana.

The Ministry of Energy

The Ministry of Energy is responsible for water-for-energy and regulates the provision of hydro-power including its distribution.

The Ministry of Health

The Ministry is responsible for policy formulation and implements its plans and programmes through the Ghana Health Service (GHS).

Ministry of Land, Forestry and Mines (MLFM)

The MLFM is responsible for ensuring the sustainable management and utilization of Ghana's lands, forests, wildlife and mineral resources for socio-economic growth and development.
The Ministry has therefore overall policy responsibility over the three sectors that have been identified as key for SLM in Ghana.

- One technical department for each sub-sector (the lands department, one for forestry and one for mines), entrusted with policy formulation, monitoring and evaluation.
- Each directorate formulates its own policy and action plan almost independently. Therefore, there is no comprehensive natural resource management policy, but a Forest and Wildlife Policy (1994), a National Land Policy (1999, amended in 2002) and a Mining Policy (1999, new draft under discussion).
- Implementation is conferred to three Commissions (except in the case of the Lands Sub-sector, composed by a variety of agencies amongst which the Lands Commission).
- Each of these Commissions functions almost independently:
    - Its legitimacy emanates directly from the Constitution.
    - They are governed by independent Boards
    - They are financed to a large extent by its internally generated resources and by resources from international cooperation.
    - Each Sub-sector has equally its own territorial structure.

- In addition

    - Two institutions charged with Forestry related research: the Forest Plantation Development Centre and the Forestry Research Institute of Ghana.
    - A Geological Survey Department charged with the development of primary information on geological resources and produces the geological map of Ghana.

It can be thus said that though the MLFM's mandate suggests an integrated approach to Ghana's natural resources, the Ministry is *de facto* an aggregation of institutions focused in its respective natural resource. Accordingly, each sub-sector functions almost independently, and few inter-sector mechanism are in place within the Ministry to ensure overall coherence. Therefore a separate table is made for each.

The Forestry Commission (FC)

The FC "shall be responsible for the regulation of the utilization of forest and wildlife resources, as well as its conservation, restoration, management and development. Without limiting the scope of sub-section 1, the Commission shall: regulate the use of forest and wildlife resources; manage the nation's forest reserves and protected areas; assist the private sector and other bodies with the implementation of forest and wildlife policies; and undertake

the development of forest plantations for the restoration of degraded forest areas, the expansion of the country's forest cover and increase in the production of industrial timber".

The FC is thus in charge of almost all forest related policies, including its planning, implementation, monitoring and evaluation, except research, a competence of the above mentioned research institutes.

According to the provided SLM definition, the principal SLM related activities of the FC would be the ones on forests conservation and forests restoration. Yet it is difficult to draw a line, since management policies might also contribute to SLM by offering incentives for sustainable forestry management.

The FC was re-established in 1999 by act 571 with the purpose of bringing together the main public bodies and agencies executing the mentioned functions; namely, the former FC, the Forestry Department and the Department of Wildlife of the MLFM, the Forests Products Inspections Board and the Timber Export Development Board. These have been restructured in three divisions:

- The Forest Services Division (2,509 staff),
- The Wildlife Division (963 staff)
- The Timber Industry Development Division (173 staff),

These remain to a considerable extent distinct bodies operating autonomously.

The FC is formally under the authority of the Ministry for policy matters, but it is governed by an autonomous board and to a large extent financed by internally generated resources.

The Minerals Commission (MC)

"The Commission's primary responsibility is to foster the efficient and effective regulation and management of the utilization of Ghana's mineral resources. This will be accomplished through the development of a solidly knowledge-based, self-led organization, which recognizes that mining investment would take place and be sustained only if it is under Win-Win circumstances."

More precisely the Minerals Commission performs the following tasks "prepares mining licenses; sells data and information to mining companies; acts as one-stop-shop for investors; monitors concession areas allocated and is responsible for registering small-scale miners". Minerals and Mining Law 1986 (PNDC Law 153) specifying ownership, administration, procedures of obtaining mineral rights for reconnaissance, prospecting or mining and other licences, such as for diverting water for mining or other industrial purposes.

Since inappropriate mining practices are a significant cause of land degradation in Ghana, the activity of MC strongly influences land degradation. Land degradation issues are not specifically mentioned in the MC's mandate, however environmental aspects related to mining are considered to be fully a function of EPA, whilst the MC would at best collaborate or provide information.

The MC functions almost autonomously from the rest of the Ministry. It has its own board, generates to a considerable extent its own resources (through royalties, donors' assistance) and has its own policy document.

The Allied Institutions in the Water Sector and their Roles

The Water Resources Information Services (WRIS) Institutions

These comprise the Hydrological Services Department, the Water Research Institute under the Council for Scientific and Industrial Research, and the Ghana Meteorological Agency. The WRIS institutions provide data and other water resources related information and services to support planning and decision making.
WRI, HSD, MSD the providers of data and information constitute the WRIS, which is an effort by DANIDA at setting up a coherent water monitoring system, of which GVP will play a key role. The baseline data on water which is being provided by HSD (surface water), MSD (meteorological parameters) and WRI (groundwater and water quality) is to be enhanced through the establishment of a well functioning hydrometric network in selected basins, assessment of sediment load for water resources management purpose, standardization of documentation on hydrogeological data and thematic mapping, monitoring of groundwater resources and their occurrences, assessment of biological indicators of pollution and strengthening of meteorological data service delivery (DANIDA 2003a).
Non-functioning measuring stations are to be rehabilitated and additional measuring stations will be set up with the assistance of DANIDA. Countrywide there are 150 stations, 76 are rehabilitated by the HSD assisted by DANIDA. - WRC is in the process of developing for parliamentary adoption a Drilling License and Groundwater Development Regulations to ensure the provision of groundwater data.

Water Research Institute (WRI)

The WRC under the CSIR aims at "generating appropriate technologies that are responsive to the private sector and socioeconomic development". It major tasks are to generate, analyze, and disseminate reliable information on the water resources of Ghana. Continued support by WHO, FAO, GTZ, UNESCO, DANIDA, French Embassy.

Ghana Meteorological Agency

The GMA exists to provide meteorological information by collecting, processing, archiving and dissemination of meteorological information to end users:
Public weather forecast on daily basis (national weather) on radio and television, collecting, processing, storing and disseminating meteorological information, undertaking collaborative work with Agricultural Agencies and others on meteorological related matters and providing expert advice etc. Clients are the General Public, Government, Armed Forces, Civil & Military Aviation, Shipping Industry, Agricultural Institutions, Commercial Institutions, Water Resource Development Management Institutions, Volta River Authority (VRA), GWCL, Water Research Institute (WRI) etc.

- Information services to the VRA provided on the basis of a standing agreement between the two organizations.
  Rainfall and Evaporation data for management of the hydro-electric dams at Akosombo and Kpong, seasonal forecast Consultancy Services.
- 10 day rainfall bulletin to WRI as per agreement between MSD and WRI.

General Services include: a) Daily weather forecast, b) Individual request for weather information for specific functions e.g. Public/private sector institutions and corporate bodies, c) Meteorological Information to the public /private sector institutions and corporate bodies.

Hydrological Services Department (HSD)

HSD is responsible for hydrological data collection on surface water and operating the national hydrometric data collection network on stream flows and sediment transport Hydrological software is located in the HSD, for processing and assessing the hydrometric data.

Council for Scientific and Industrial Research (CSIR)

Established by NLC Decree 293 of October 10, 1968 and re-established by CSIR Act 1996 (Act 521) on November 26, 1996. Its Vision is to become a Centre of Excellence in Research and Development (R & D) by generating technologies that are responsive to demands of the Private Sector and socio-economic development. CSIR's Mission is to generate and apply innovative technologies which efficiently and effectively exploit Science and Technology (S & T) for socio-economic development in the critical areas of agriculture, industry, health and environment and improve scientific culture of the civil society. Technologies developed are to be commercialized for Private Sector Development in Ghana and abroad. Mandate to pursue the implementation of government policies on scientific research and development, to advise the Minister on scientific and technological advances likely to be of importance to national development, to encourage co-ordinated employment of scientific research for the management, utilization and conservation of the natural resources of Ghana in the interest of development, to co-ordinate all aspects of scientific research in the country and to ensure that the Council, the research institutes of the Council and other organizations engaged in research in Ghana, co-ordinate and co-operate in their research efforts, to institute a system of contract research to ensure that research being carried out in the Council is relevant and cost effective, to encourage and promote the commercialization of research results, to undertake or collaborate in the collation, publication and dissemination of the results of research and other useful technical information, to encourage them training of scientific personnel and research workers through the provision of grants and fellowships, etc.
The CSIR comprises 13 research institutions including the WRI (HSD and MSD are not part of CSIR. They are also not research institutions.)

International Water Management Institute (IWMI)

IWMI is a nonprofit scientific research organization focusing on the sustainable use of water and land resources in agriculture and on the water needs of developing countries. IWMI works with partners in the South to develop tools and methods to help these countries eradicate poverty through more effective management of their water and land resources.

Mission: Improving water and land resources management for food livelihoods and nature.

The objectives of IWMI's work:

- *Identify the larger issues related to water management and food security* that need to be understood and addressed by governments and policymakers.
- *Develop, test and promote management practices and tools* that can be used by governments and institutions to manage water and land resources more effectively, and address water scarcity issues.

- *Clarify the link between poverty and access to water* and to help governments and the research community better understand the specific water-related problems of poor people.
- *Help developing countries build their research capacities* to deal with water scarcity and related food security issues.

Research Themes:

IWMI's research is organized around five themes. The themes were selected based on two criteria: 1) they address issues crucial to developing countries, and 2) they comprise areas where IWMI has the resources and expertise to make a significant contribution.

- Integrated Water Resource Management for Agriculture
- Sustainable Smallholder Land and Water Management
- Sustainable Groundwater Management
- Water Resource Institutions and Policies
- Water, Health and Environment

IWMI has research projects running in 21 countries in Asia and Africa. Work is coordinated through regional offices located in India, Pakistan, South Africa, Sri Lanka and Thailand. The Institute has subregional offices in Ethiopia, Ghana, Nepal, Uzbekistan, China, and Laos. The Institute has a multidisciplinary approach to water management research. Most of IWMI's research combines the expertise of economists, agronomists, hydrologists, engineers, sociologists, management specialists and health researchers. The research team is composed of approximately 100 scientists from 16 different countries.

Funding:

IWMI is a member of the Future Harvest group of agricultural and environmental research centers. It receives its principal funding from governments, private foundations, and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR), which contribute to poverty eradication.

Donors:

IWMI's funding support is provided by the following governments, government agencies, development banks, and foundations: African Development Bank, Asian Development Bank, Australia, Belgium, Cambodia, Canada, China, Denmark, Food and Agriculture Organization, Ford Foundation, France, Germany, India, IDRC, Iran, Ireland, Japan,
Netherlands, Norway, South Africa, Sri Lanka, Sweden, Switzerland, UNEP, UNESCO, United Kingdom, USA, World Bank. The Governments of India, Iran, Nepal, Pakistan, South Africa, Sri Lanka, and Thailand provided program support for IWMI-related activities in those countries.

Volta River Authority (VRA)

VRA's function is to supply electrical energy for industrial, commercial and domestic use in Ghana. The VRA has the mandate to plan, execute and manage the development of the Volta River.

Kwame Nkrumah University of Science and Technology (KNUST)

The Kwame Nkrumah University of Science & Technology (KNUST) (formerly the University of Science and Technology) succeeded the Kumasi College of Technology, which was established by a Government Ordinance on October 6, 1951. Faculty of Agriculture, School of Engineering, College of Art, Faculty of Pharmacy, Institute of Renewable Natural Resources, Department of Freshwater Fisheries and Watershed Management, Faculty of Science, Institute of Mining and Mineral Engineering, Faculty of Social Sciences, Faculty of Environmental & Development Studies, Institute of Land Management & Development INSTITUTES & CENTRES which offer research, technical training, consultancy and other specialized services to government, private industry and other user-agencies: Technology Consultancy Centre (TCC), Bureau of Integrated Rural Development (BIRD), Training Network Centre (TNC), Centre for Cultural Studies (CCS), Institute for Technical Education (ITE), Distance Learning Centre (DLC).

University for Development Studies (UDS)

The University for Development Studies was established in 1992 as a multi-campus institution to serve the four northern regions of Ghana (Brong-Ahafo, Northern, Upper East and Upper West Regions) in which rural poverty and environmental degradation are generally prevalent. The objective is not only to train students to live and work in rural communities, but also to equip them with the relevant skills and expertise to prepare them for self-employment. The Third Trimester Field Practical Training Program is a distinguishing feature of the University.
The University currently focuses on studies in: Agricultural Sciences, Medicine and Health Sciences, Applied Sciences, Integrated Development Studies and Inter-disciplinary Research. The University has five campuses spread over the four regions: Nyanpala Tamale campus (houses the Faculty of Agriculture), Navrongo campus (hosts the Faculty of Integrated Development studies), Tamale campus (for the School of Medicine and Health Sciences), Kintampo campus (houses Allied Health Sciences), Wa campus (under-construction will be home to the Faculty of Applied Sciences).

University of Ghana

Premier university of the country based in Accra. It is made up of Faculties of Arts, Social Sciences, Agriculture and Science. The Faculty of Social Sciences comprises Departments of Archaeology, Economics, Geography and Resource Development, History, Library and Archival Studies, Nursing, Political Science, Psychology and Sociology as well as ISSER and CSPS (GVP partners). Scientists from the Faculties of Agriculture and Science used to work in the Volta River Research Project.

The Public Utilities Regulatory Commission

The Commission regulates the standard of services including the quality of drinking water provided by GWCL and also the tariff set by the company for urban water supply.

The Ghana Standards Board

It is responsible for developing and setting quality standards for drinking water including certification and other related uses.

The Town and Country Planning

The Town and Country Planning supports DAs in physical planning of towns and provides layouts of towns that give land-use and directs development services like roads, drainage networks, electricity and water supply distribution lines. This is to guide DAs to regulate the grant of permits for various classes of buildings (housing, industrial, commercial, institutional) and control development.

The Ministry of Finance and Economic Planning (MoFEP)

The Ministry of Finance and Economic Planning administers all public investments in water including negotiating for grants and loans.

The Ministry of Women and Children (MOWAC)

The Ministry of Women and Children is the lead agency responsible for implementing the National Gender and Children's Policy launched in September 2004. The National Gender and Children's Policy is the framework for gender equality issues. Policy issues on water that affect the well being of women and children is within the mandate of MOWAC.

The Parliamentary Committee on Works and Housing and Parliament of Ghana

The Parliamentary Committee on Works and Housing and Parliament of Ghana provides legislative oversight of the water sector.

The Environmental Protection Agency (EPA)

The EPA is under MES. The role of EPA covers, among others, protection of water resources and regulation of activities within catchment areas including setting effluent standards.

It is responsible for policy and environmental standards' formulation, planning and data collection; and promotion of environmental governance through the issuance of permits; awareness raising activities, the coordination of activities of local and international agencies and institutions and the realization of environmental impact assessment for activities potentially degrading the ecosystem.

EPA is largely conceived as a cross-cutting agency with a regulating and coordinating role of public and private activities rather than an implementing agency of these, except for environmental impact assessments mandatory for the initiation of certain economic activities (mainly industry, mining).

District level or regional authorities and organizations

Association of Water and Sanitation Development Boards (AWSDB)

The AWSDB is the only umbrella organization of its kind in Ghana covering the three northern Regions. It was founded in Navrongo in 1995, initiated and promoted by CIDA. The member WSDBs are all from small towns where CIDA rehabilitated or is rehabilitating broken down water supply systems. Initially, the association represented 14 small town WSDBs but over the years the number of members has increased to 36, of which 15 are based in the Northern Region, 9 in the Upper West Region and 12 in the Upper East Region.
There is some interest in the southern parts of Ghana to found a similar association. The AWSDB supports it by providing information and guidance. Partners of cooperation: the CWSA, the District Assemblies of the three
Northern Regions, the Northern Regional Guinea Worm Eradication Programme, the Community Partnership for Health & Development and the Savannah Resource Management Project. Activities have included:

- Guiding communities to make informed decisions regarding their water & sanitation needs in line with the national community water & sanitation strategy
- Facilitating the formation of WATSANs, WSDBs, dam management committees, etc.
- Development of training materials for the training of WATSANs
- Training of WATSANs on financial management and bookkeeping, operation and maintenance of hand pumps, health & hygiene education and community development activities and WSDBs on the use of participatory methodologies, community entry and mobilization, group formation and group dynamics, watershed management, pump operation, maintenance and repair, dam site selection, design and construction
- Training of communities on watershed management to protect and conserve the integrity of water bodies and on operations and maintenance of hand-dug wells
- Conducting technical assessment of the status of existing water & sanitation facilities
- Rehabilitation and construction of hand-dug wells
- Designing, coordinating and facilitating socio-cultural surveys or researches
- Development of water & sanitation status monitoring indicators
- Development of business plans and fund mobilization and investments

Regional Water and Sanitation Teams (RWSTs)

RWSTs of the CWSA manages all investments by coordinating and integrating all the annual work-plans and budget of all participating districts fully represented in all the regions.

Local Actors, Organizations and Authorities

Chiefs

Although chiefs have no formal political authority, they have power to influence or even determine the decisions regarding the management of natural resources at the local level. Family and land disputes as well as development issues can also be dealt with by the village chief and elders.

District Water and Sanitation Teams (DWSTs)

The DWSTs are in charge of water and sanitation issues at the district level. The WATSANs are to be formed, trained and supervised by the DWSBs, which themselves are trained and promoted by the CWSA's Regional offices.

Water and Sanitation Committees (WATSANs)

Gender-balanced, elected committees to manage point water sources and oversee household latrine maintenance and hygiene promotion. WATSANs are formed and trained – e.g. by WaterAid partners - to operate and maintain the infrastructure and to create the necessary revenue to cater for repairs and the procurement of spare parts.

Water and Sanitation Development Boards (WSDBs)

Gender balanced elected committees for rural/small urban piped schemes. Like the WATSANs, they are mandated to represent the communities' aspirations and interest during subprojects' planning and implementation and to manage the facilities after hand-over. - Their legal status vis-à-vis the companies they contract is an open issue.

Water Users Association (WUA)

The WUA was formed at the request of the GIDA, supported by the WB, IFAD and other donors. The WUA is responsible for the operation and maintenance of the dams, allocation of land to WUA members, collection of water fees and providing agricultural services on the sites.

Coalition of NGOs in Water and Sanitation (CONIWAS)

Founded in 2003 with the objectives of presenting one voice of NGOs in the water and sanitation sub-sector in Ghana, improving coordination and networking among NGOs and community based organisations (CBOs) engaged in the sub-sector.
To act as a link between its members and the government departments involved in the provision of water and sanitation services. Works in partnership to influence policies, remove barriers, and promote access to potable water, safe sanitation and improved hygiene for the poor and vulnerable. The Coalition is not financially viable and is donor-dependent (DANIDA, World Vision, WaterAid and others). Head Office established in Accra in May 2005.

Association of Water and Sanitation Development Boards (AWSDB)

It is an umbrella organization covering the three northern Regions. It was founded in Navrongo in 1995 under the initiative and promotion of CIDA.
Partners of cooperation: the CWSA, the District Assemblies of the three Northern Regions, the Northern Regional Guinea Worm Eradication Programme and the Community Partnership for Health & Development.

Activities:

- Guiding communities to make informed decisions regarding their water & sanitation needs in line with the national community water & sanitation strategy
- Facilitating the formation of WATSANs, WSDBs, dam management committees, etc.
- Development of training materials for the training of WATSANs
- Training of WATSANs on financial management and bookkeeping, operation and maintenance of hand pumps, health & hygiene education and community development activities and WSDBs on the use of participatory methodologies, community entry and mobilization, group formation and dynamics, watershed management, pump operation, maintenance and repair, dam site selection, design and construction
- Training of communities on watershed management to protect and conserve the integrity of water bodies and on operations and maintenance of hand-dug wells
- Conducting technical assessment of the status of existing water & sanitation facilities
- Rehabilitation and construction of hand-dug wells
- Designing, coordinating and facilitating socio-cultural researches
- Development of water & sanitation status monitoring indicators
- Development of business plans and fund mobilization and investments

Farming Communities in the Volta River Basin

They form the majority of the electorate and the main land users in the Volta River Basin and their activities will significantly impact the GEF-Volta Project.

Activities

- Participate in government by voting in general elections and electing District Assembly members
- Use slah and burn land clearing system to farm
- Cultivate and irrigate vegetables along river banks
- Apply various agro-chemicals in their farm enterprise
- Graze and water their livestock
- Fish in the river using unorthodox methods (agro-chemicals) in some cases
- Harvest fuelwood and produce charcoal

6.4 Annex D: Matrix of Institutional Analyses

SN		Key Actors	Surface Water												Ground Water									
			Planning, Policy Formulation & Coordination	Quantify Water	Issue Permit	Set/Regulate tarrif/Service fee	Allocate Water	Construct Facilities	Distribute Water	Maintain Facilities	Monitor Quality	Ensure Quality	Protect Against Flooding	Protect Ecology	Planning, Policy Formulation & Coordination	Quantify Water	Issue Permit	Set/Regulate tarrif/Service fee	Allocate Water	Construct Facilities	Withdraw/Distribute	Maintain Facilities	Monitor Quality	Ensure Quality
1	Ministries	The Ministry of Water Resources, Works and Housing (MWRWH)	++	o	o	o	o	o	o	o	o	o	o	o	++	o	o	o	o	o	o	o	o	o
2		Ministry of Environment and Science	++	x	x	x	x	x	x	x	o	o	+	+	++	o	o	o	o	o	o	o	o	o
3		Ministry of Local Government and Rural Development	+	x	x	x	x	+	x	+	x	o	+	o	+	x	x	x	x	+	o	o	x	x
4		Ministry of Food and Agriculture (MoFA)	++	o	x	x	o	++	x	+	+	x	o	+	+	x	x	x	x	x	x	x	o	x
5		Ministry of Energy	++	o	x	x	o	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6		Ministry of Health	++	x	x	x	x	x	x	x	x	x	x	x	++	x	x	x	x	x	x	x	o	o
7		Ministry of Land, Forestry and Mines (MLFM)	++	x	x	x	x	x	x	x	x	x	x	x	++	x	x	x	x	x	x	x	x	x
8	Major National Agencies	Volta River Authority (VRA)	++	+	x	x	x	+	+	+	o	x	++	+	x	x	x	x	x	x	x	x	x	x
9		Ghana Water Company Limited (GWCL)	++	++	x	++	++	++	++	++	++	++	+	+	++	+	x	++	o	++	o	o	+	o
10		Ghana Irrigation Development Authority (GIDA)	++	++	o	++	+	++	++	++	+	+	o	+	++	o	x	o	o	x	o	x	x	x
11		Community Water and Sanitation (CWSA)	++	+	x	++	+	+	+	+	+	x	x	o	++	++	x	++	++	++	++	++	++	++
12	Regulatory Bodies	Water Resources Commission (WRC)	++	+	++	x	++	x	x	x	++	++	o	+	++	++	++	x	++	x	x	x	++	+
13		The Public Utilities Regulatory Commission (PURC)	++	x	o	++	x	x	x	x	x	x	x	x	++	x	x	++	x	x	x	x	x	x
14		Lands Commission (LC)	++	x	x	x	x	x	x	x	x	x	x	+	x	x	x	x	x	x	x	x	x	x
15		Environmental Protection Agency (EPA)	++	o	o	x	x	x	x	x	++	++	o	++	++	x	o	x	x	x	x	x	++	++
16		Ghana Standards Board (GSB)	+	x	x	x	x	x	x	x	+	+	x	x	+	x	x	x	x	x	x	x	+	+
17		Minerals Commission (MC)	++	x	x	x	x	x	x	x	++	+	x	o	+	x	x	x	x	x	x	x	+	o
18		Energy Commission (EC)	+	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
19		Forestry Commission (FC)	+	x	x	x	x	x	x	x	x	x	+	++	+	x	x	x	x	x	x	x	x	x
20		Town and Country Planning	+	x	x	x	x	x	x	x	+	++	x	+	+	x	x	x	x	x	x	x	x	x
21		Fisheries Commission	++	x	x	x	x	x	x	x	++	+	x	++	x	x	x	x	x	x	x	x	x	x

SN		Key Actors	Surface Water												Ground Water									
			Planning, Policy Formulation & Coordination	Quantify Water	Issue Permit	Set/Regulate tarrif/Service fee	Allocate Water	Construct Facilities	Distribute Water	Maintain Facilities	Monitor Quality	Ensure Quality	Protect Against Flooding	Protect Ecology	Planning, Policy Formulation & Coordination	Quantify Water	Issue Permit	Set/Regulate tarrif/Service fee	Allocate Water	Construct Facilities	Withdraw/Distribute	Maintain Facilities	Monitor Quality	Ensure Quality
22	Actors at the subonational level	The District Assembly (DA)	++	x	x	+	x	++	x	++	o	o	++	o	++	x	x	x	x	++	x	++	o	o
23		District Water and Sanitation Teams (DWSTs)	++	x	x	+	x	+	x	+	+	+	o	o	+	x	x	+	x	+	x	+	+	+
24		Water and Sanitation Committees (WATSANs)	++	x	x	+	x	+	x	++	+	+	o	o	+	x	x	+	x	+	x	++	+	+
25		Association of Water and Sanitation Development Boards (AWSDB)	+	x	x	x	x	x	x	x	x	x	x	x	+	x	x	x	x	x	x	x	x	x
26		Water and Sanitation Development Boards (WSDBs)	+	x	x	x	x	x	x	++	x	x	x	x	+	x	x	x	x	x	x	++	x	x
27		Water Users Association (WUA)	++	x	x	o	x	x	x	+	+	+	+	+	++	x	x	x	x	x	x	+	+	+
28		Farmers in the Volta River Basin	+	x	x	x	x	x	x	+	x	x	+	x	o	x	x	x	x	x	++	x	x	x
29	Research Institutions	Water Research Institute (WRI)	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
30		Ghana Meteorological Agency (GMA)	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
31		Council for Scientific and Industrial Research (CSIR)	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
32		International Water Management Institute (IWMI)	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
33		Hydrological Services Department (HSD)	+	++	x	o	o	o	x	x	o	o	++	o	+	o	x	o	o	x	x	x	o	x
34		Kwame Nkrumah University of Science and Technology	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
35		University of Ghana, Legon	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
36		University of Development Studies	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
37		University of Cape Coast	+	o	x	o	o	x	x	x	o	o	o	o	+	o	x	o	o	x	x	x	o	x
38	Service Providers	Coalition of NGOs in Water and Sanitation (CONIWAS)	+	o	x	o	o	++	x	+	+	o	+	++	+	x	x	o	x	++	x	+	++	o
39		Consultants	+	x	x	x	x	x	x	x	x	x	x	x	+	x	x	x	x	x	x	x	x	x
40		Water Tankers Association	+	x	x	+	x	x	++	x	x	x	x	x	+	x	x	+	x	x	++	x	x	x
41		Private Companies	+	x	x	x	x	x	+	x	x	x	x	x	+	x	x	x	x	+	+	x	x	x
42	Donors	World Bank Group (WBG)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x
43		Danish International Development Agency (DANIDA)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x
44		Canadian International Agency (CIDA)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x
45		European Union (EU)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x
46		Geseltlschaft fÜr Technische Zusammenarbeit o Germany (GTZ)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x
47		Kreditanstalt fÜr Wiederaufbau o Germany (KFW)	++	x	x	o	x	++	x	++	o	x	o	o	++	x	x	o	x	++	x	++	o	x

SN		Key Actors	Waste Water						land Mgt					Soil Mgt		IWRM		
			Authorize discharges	Construct Facilities	Operate Facilities	Maintain Facilities	Monitor Quality	Enforce Quality	Planning, Policy Formulation & Coordination	Advise on land use	Control Deforestation	Involved in Reforestation	Erosion Control	Soil fertility improvement	Soil&Water Conservation & Management	Organise Short Course	Run MSc Program in WRM	Research
1	Ministries	The Ministry of Water Resources, Works and Housing (MWRWH)	x	x	x	x	x	x	x	o	x	x	x	x	x	x	x	x
2		Ministry of Environment and Science	x	+	x	+	o	o	++	+	o	o	o	o	o	x	x	x
3		Ministry of Local Government and Rural Development	x	o	x	+	x	x	+	o	x	x	x	x	x	x	x	x
4		Ministry of Food and Agriculture (MoFA)	x	x	x	x	x	x	++	+	o	o	o	o	o	x	x	x
5		Ministry of Energy	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
6		Ministry of Health	x	x	x	x	o	x	x	x	x	x	x	x	x	x	x	x
7		Ministry of Land, Forestry and Mines (MLFM)	x	x	x	x	x	x	++	+	+	+	o	x	o	x	x	x
8	Major National Agencies	Volta River Authority (VRA)	x	x	x	x	x	x	++	+	o	o	+	x	x	x	x	x
9		Ghana Water Company Limited (GWCL)	x	+	o	+	+	x	++	++	+	o	+	x	x	x	x	x
10		Ghana Irrigation Development Authority (GIDA)	x	x	x	x	x	x	++	++	+	++	+	++	++	x	x	x
11		Community Water and Sanitation (CWSA)	o	++	o	++	+	o	+	+	x	x	+	x	x	x	x	x
12	Regulatory Bodies	Water Resources Commission (WRC)	x	x	x	x	+	+	++	++	++	++	++	o	+	x	x	++
13		The Public Utilities Regulatory Commission (PURC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
14		Lands Commission (LC)	x	x	x	x	x	x	++	++	+	o	o	x	x	x	x	x
15		Environmental Protection Agency (EPA)	++	x	x	x	++	++	++	++	++	++	++	+	+	x	x	x
16		Ghana Standards Board (GSB)	+	x	x	x	+	+	+	x	x	x	x	x	x	x	x	x
17		Minerals Commission (MC)	x	x	x	x	x	x	++	o	x	xo	x	x	x	x	x	x
18		Energy Commission (EC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
19		Forestry Commission (FC)	x	x	x	x	x	x	++	++	++	++	++	+	+	x	x	x
20		Town and Country Planning	+	x	x	x	++	++	++	+	x	x	x	x	x	x	x	x
21		Fisheries Commission	x	x	x	x	x	x	+	o	x	o	x	x	x	x	x	x

SN		Key Actors	Waste Water						land Mgt					Soil Mgt		IWRM		
			Authorize discharges	Construct Facilities	Operate Facilities	Maintain Facilities	Monitor Quality	Enforce Quality	Planning, Policy Formulation & Coordination	Advise on land use	Control Deforestation	Involved in Reforestation	Erosion Control	Soil fertility improvement	Soil&Water Conservation & Management	Organise Short Course	Run MSc Program in WRM	Research
22	Actors at the subonational level	The District Assembly (DA)	o	++	+	++	++	++	++	+	++	++	++	++	++	x	x	x
23		District Water and Sanitation Teams (DWSTs)	x	+	+	+	+	+	x	+	x	x	x	x	x	x	x	x
24		Water and Sanitation Committees (WATSANs)	x	+	+	+	+	+	x	+	x	x	x	x	x	x	x	x
25		Association of Water and Sanitation Development Boards (AWSDB)	x	x	o	+	x	x	+	x	x	x	x	x	x	x	x	x
26		Water and Sanitation Development Boards (WSDBs)	x	x	++	++	o	x	+	x	x	x	x	x	x	x	x	x
27		Water Users Association (WUA)	x	+	+	+	+	o	+	+	+	++	++	+	++	x	x	x
28		Farmers in the Volta River Basin	x	x	x	x	x	x	+	x	+	++	+	++	++	x	x	x
29	Research Institutions	Water Research Institute (WRI)	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
30		Ghana Meteorological Agency (GMA)	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
31		Council for Scientific and Industrial Research (CSIR)	x	x	x	x	o	x	+	++	o	o	o	+	+	x	x	++
32		International Water Management Institute (IWMI)	x	x	x	x	o	x	+	++	o	o	o	+	+	x	x	++
33		Hydrological Services Department (HSD)	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
34		Kwame Nkrumah University of Science and Technology	x	x	x	x	o	x	+	++	o	o	o	o	+	++	++	++
35		University of Ghana, Legon	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
36		University of Development Studies	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
37		University of Cape Coast	x	x	x	x	o	x	+	++	o	o	o	o	+	x	x	++
38	Service Providers	Coalition of NGOs in Water and Sanitation (CONIWAS)	o	++	o	+	+	o	+	++	+	++	++	++	++	x	x	x
39		Consultants	x	x	x	x	x	x	+	+	o	o	o	o	o	x	x	+
40		Water Tankers Association	x	x	x	x	x	x	x	x	o	o	o	o	o	x	x	x
41		Private Companies	x	x	x	x	x	x	+	+	o	o	o	o	o	x	x	o
42	Donors	World Bank Group (WBG)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o
43		Danish International Development Agency (DANIDA)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o
44		Canadian International Agency (CIDA)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o
45		European Union (EU)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o
46		Geseltlschaft fÜr Technische Zusammenarbeit o Germany (GTZ)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o
47		Kreditanstalt fÜr Wiederaufbau o Germany (KFW)	x	+	x	+	o	x	+	o	+	+	+	o	o	x	x	o

Key:

- ++ Actively involved
- + partially involved
- o Not directly involved
- x Not involved at all

6.5 Annex E: Course Structure

COURSE INFORMATION

Name of College: College of Engineering

Name of Faculty: Faculty of Civil and Geomatic Engineering,

Name of Department: Civil Engineering Department

Title of Proposed MSc Programme: MSc in Water Resources Engineering and Management

Project Office: WRESP Office, Civil Engineering Department, KNUST, Kumasi
Tel: +233-51-60235, Fax: +233-51-60235
Website: www.wresp.org
Email: info@wresp.org

Introduction

The objectives for the review of the existing Water Resources Engineering MSc programme in the Department of Civil Engineering (DCE) are:

- To modernise the existing curricula by incorporating current developments in water resources to the subject matter.
- To meet the needs of stakeholders by adding water resources management to the existing curricula to form a new programme called Water Resources Engineering and Management (WREM).
- To make the programme duration 18 months.

These have become necessary because during the last few decades, the demand for water has increased significantly, whilst the rainfall pattern has become less reliable, possibly as a result of climate change. All projections indicate further major increases in the future; Ghana projects a 5-fold increase in consumptive water use between 2000 and 2020. Interconnections in the water resources system are therefore becoming more apparent than in the past, demanding an inter-sectoral and transboundary approach. The West African Region has articulated the need for a holistic and integrated approach towards water resources development and management. This is expressed in the West African Regional Action Plan for Integrated Water Resources Management (WARAP-IWRM) which was agreed among 16 countries, including Ghana. Moreover, in 1999 the six riparian states of the Volta Basin formally agreed to collaborate on Integrated Water Resources Management (IWRM) (The Accra Declaration).

The formulation and adoption of the Millennium Development Goals (MDGs) by the UN has given a new urgency for proper water resources management. Most of these goals cannot be achieved without IWRM as elaborated below:

- Improved use of rainfall and irrigation water will increase crop yields and help reduce hunger. In addition increased access to productive water will also reduce poverty;
- Improved operation and maintenance of existing water supply systems and sanitation and sewer infrastructure, and the construction of new ones will significantly increase access and thereby reduce child mortality and the incidence of malaria and other waterborne diseases, and will have a positive effect on maternal health;

- Inclusion of the environment as a legitimate water use, improved water quality management and watershed management will all contribute to reversing the current trend of environmental resources degradation.

The Ministerial Conference of the 3rd World Water Forum in March 2003 realising the importance of Water in achieving the MDGs declared, "Water is a driving force for sustainable development including environmental integrity, and the eradication of poverty and hunger is indispensable for human health and welfare." The Conference also recognised capacity building as one of the three most important prerequisites to succeed in our efforts.

In its efforts to address the MDGs, The Government of Ghana (GoG) has formulated a number of strategic documents: "Ghana Water Vision - 2025", "National Environmental Sanitation policy" and most recently, "Ghana Poverty Reduction Strategy". The Ghana Water Vision addresses four themes:

- Water for food;
- Water (and sanitation) for people;
- Water and Nature;
- Integrated Water Resources Management.

Realising this Vision, as well as achieving the MDGs, requires a well-planned approach over the coming decades. Ghana has started implementing Integrated Water Resources Management (IWRM), with the establishment in 1998 of the Water Resource Commission (WRC) as the central authority governing the entire water sector. The new legislation streamlines the coordination among the various sectors. The introduction of water licensing (by WRC) ensures that water is viewed as a valuable and scarce resource. A new water policy has been formulated, which acknowledges the importance of transboundary cooperation with riparian countries.

In view of the above, a capacity-building project under the theme "Water Resources and Environmental Sanitation Project" (WRESP) was established by the DCE of KNUST with technical support from UNESCO-IHE Institute for Water Education, Delft, to strengthen the education, training, research and consultancy capacity of the DCE. This is to support the needs of the water resources sector, including the water supply and sanitation sub-sector in Ghana and the sub-region. The project is supported financially by the Dutch Government Department for International Cooperation - NUFFIC.

There is the need to train professionals and provide them with knowledge and skills relevant to the African condition. This is to enable them meet the needs and demands of the water industry in the 21st Century. The training and re-training of professionals in the water sector must now be part of the central focus of academic institutions that have long traditions of providing quality and leadership training as well as professional expertise.

To meet these needs, the DCE together with UNESCO-IHE Institute for Water Education, and the Technical University of Delft have developed this 18-month MSc. programme in Water Resources Engineering and Management to address human resource needs in Ghana and the sub-region. The programme is a result of fusing two separate programmes - *Water Resources Engineering* and *Water Resources Management*. The concept is to train professionals in the wider field of water resources to enable them meet challenges in the modern sector as reflected in the modules described in Table 3.

Course objective

The reviewed programme in Water Resources Engineering and Management aims at

- Modernising the existing curricula by incorporating current developments in water resources to the subject matter.
- Meeting the needs of stakeholders by adding water resources management to the existing curricula to form a new programme called Water Resources Engineering and Management (WREM).
- Increasing the programme duration from the original 15 months to 18 months.

This reviewed programme aims at producing water engineers and managers with expertise in the field of Water Resources, Hydrology, Hydraulics and Environmental Management. Participants will have a clear understanding of Integrated Water Resources Management to play essential roles in Government institutions and in the private sector in the integrated management of water resources. The participants after completion will be equipped to plan, design, operate and manage water resources projects.

Target groups and employment opportunities

The course targets young and mid-career professionals in the water sector. It is expected to benefit individuals working and seeking to work with organizations dealing with

- Hydrological and meteorological data;
- Design and operation of water resources projects, e.g., irrigation, hydropower, water resources development, etc;
- Management of water resources systems;
- Planning and implementation of water policies and dealing with transboundary issues;
- Research institutes, tertiary institutions, and NGOs.

Entry requirements

The basic entry requirements are those specified by the University as detailed below.

1. First or Second Class (Upper Division) degree or its equivalent in Civil Engineering, Geological Engineering and other programmes relevant to water resources, or any field of specialisation relevant to the water resources industry, from a recognized University;
2. Applicants with qualifications other than those specified in (1) above shall be interviewed and if necessary, may be required to take a written examination before admission;
3. Applicants whose working language is not English must show that they have good command of both spoken and written English. Wherever necessary, arrangements will be made with the Department of Languages for the acquisition of the necessary English language skills prior to embarking on the course;
4. Relevant office or field experience will be an advantage.

Mode of assessment

Students seeking the Master of Science degree in Water Resources Engineering and Management will be assessed through:

- Graded Examinations;
- Individual and Group Project Work (design exercises, group projects);
- Individual research (MSc Thesis).

An examination is conducted after every course module. Any student who fails a course shall re-sit the paper until a pass mark of 50% or more is attained. Project and design works will be

assessed through oral examination before a panel of examiners. Individual research (thesis) will also be assessed by external and internal examiners.

Requirements for graduation

- The minimum time for the completion of the full time MSc (Water Resources Engineering and Management) programme shall be 18 months. The first two sessions will be dedicated to lectures and the third session for the individual thesis.
- The programme may also be taken over a 3-year period for part-time students and the MSc. degree awarded after meeting all the requirements specified.
- Each student is supposed to undertake a detailed research project under the supervision of a university lecturer leading to an externally and internally examinable thesis. The thesis is then defended during an oral examination.
- Students will be required to attend seminars given by professionals from industry, and take part in field trips (study tour) organized as part of the programme.
- The minimum number of credit hours required for graduation is 48.
- The pass mark for any course subject shall be 50% and the minimum Cumulative Weighted Average (CWA) for graduation shall be 55%.

Students intake

A maximum intake of fifteen (15) students per academic year from Ghana and the sub-region is envisaged.

Course duration

The MSc. Course in Water Resources Engineering and Management is designed to be completed within 18 months (3 semesters). Basically, semester 1 for each batch of students will commence with the University academic year.

Session 1	Modules: 1 - 4	August to December
Session 2	Modules: 5 - 8	January to May
Session 3	Module: 9	June to December

Course structure

The Water Resources Engineering and Management programme consists of a total of nine modules, eight for sessions 1 and 2, and one for session 3. All the modules consist of 48 credits, made up of 31 credits from lectures and 17 credits from practical work. A credit is equivalent to 1 hour of lecture or 2 hours of practical work (in the same course) per week in a sixteen (16) week semester. Thus one credit of a module is equivalent to 16 hours of lecture or 32 hours of practical work. Upon completion of a module, students are given a few days to revise and examinations are offered on the courses. The MSc thesis is a 12-credit work and it allows students to conduct research study into a locally relevant water resources problem and produce a report in a standard thesis format. Study tours (field trip) to the field where students undertake practical work will be organised at the end of session 2 for the students.

Didactics

The method of teaching and transfer of information to students will be in the form of:

- Lectures
- Workshops and design exercises*
- Tutorials
- Laboratory work

- Field trips
- E-learning, video-conferencing

* Workshop and design sessions give students the opportunity to present their findings for discussion.

Table 1. Summary of Courses and Credit

Module	Module Name	Course Code	Course Name	T (hr)	P (hr)	Total Credits
1	Introduction to Water Resources	CEWR 511	Integrated Water Resources Management	1	1	1
		CEWR 513	Meteorology and Hydrometry	1	1	1
		CEWR 515	Applied Hydraulics	1	1	1
		CEWR 517	Urban Hydrology and Urban Drainage	2	1	2
			Total Credits	**5**	**4**	**5**
2	Mathematics and Research Methods	CEWR 521	Mathematics and Statistics for Water Engineers	1	1	1
		CEWR 523	GIS and Data Management in Water Systems	1	2	2
		CEWR 525	Research Methodology	1	0	1
			Total Credits	**3**	**3**	**4**
3	Advanced Hydrology and Modelling	CEWR 531	Applied Hydrology	2	0	2
		CEWR 533	Hydrogeology	2	1	2
		CEWR 535	Water Systems Modelling	1	2	2
			Total Credits	**5**	**3**	**6**
4	Environmental Quality	CEWS 541	Environmental Issues and Impact Assessment	1	1	1
		CEWS 543	Water Quality Management and Public Health	2	1	2
			Total Credits	**3**	**2**	**3**
			Sub-total for Semester 1	**16**	**12**	**18**
5	Water Resources Engineering	CEWR 552	Reservoir Development & Operation	1	0	1
		CEWR 554	Small Hydraulic Structures	1	0	1
		CEWR 556	Irrigation Engineering	2	1	2
		CEWR 558	Hydro-Power Development	2	0	2
			Total Credits	**6**	**1**	**6**
6	Water Resources Management	CEWR 562	Water and Environmental Law	2	1	2
		CEWR 564	River Basin Management	2	1	2
		CEWR 566	Water Resources Planning	2	0	2
			Total Credits	**6**	**2**	**6**
7	Management and Institutions	CEWS 572	Community Participation and Institutional Development	1	0	1
		CEWS 574	Water Project Management	1	1	1
		CEWS 576	Engineering Economy and Financial Management	1	0	1
			Total Credits	**3**	**1**	**3**

Module	Module Name	Course Code	Course Name	T (hr)	P (hr)	Total Credits
8	Project Design WREM	CEWR 582	Group Project	0	6	3
			Total Credits	**0**	**6**	**3**
			Sub-Total for Semester 2	**15**	**10**	**18**
9	Thesis WREM	CEWR 691	Individual Research Dissertation	**0**	**24**	**12**
			Sub-Total for Semester 3	**0**	**24**	**12**
			TOTAL COURSE CREDITS	**31**	**46**	**48**

Facilities

A list of equipment at the Environmental Quality Engineering and the Hydraulics Laboratories are presented in the Tables belows. The Department has a 30 room hostel facility (Steven Paris Hostel) to accommodate students and two suites for guest lecturers.

Funding and supporting of programme

i. External Sources: Dutch Government Department for International Cooperation - NUFFIC
ii. The programme is ran in collaboration with UNESCO-IHE, Delft, The Netherlands.
iii. Other Sources: DANIDA and student fees
iv. Ghana Government: Salaries of staff of Department of Civil Engineering

NB: The two programs: Water Resources Engineering and Management (WREM) and Water Supply and Environmental Sanitation (WSES) are jointly catered for under the MOA under the common name: Water Resources and Environmental Sanitation (WRES).

EQE Laboratory Equipment for Teaching and Research

Atomic Absorption Spectrophotometer AAS
Autoclave, Centrifuge
Balance
COD Reactor
Computer
Data logging Spectrophotometer, Visible Spectrophotometer,
Fluoride Electrodes
Fridges, Water Bath
Glassware
Incubator, Oven, Furnace
Laboratory Flocculator
Laminar Flow
Mass Spectrophotometers
Membrane Filtration Units
Microscopes
Nessleriser,
Oximeter, Conductivitimeter
Particle Size Analyser
Peristaltic Pump
Phosphorus Electrodes
Shaker, Hot Plate/Stirrer, Stirrer, Six Unit Hot Plate
Sound Level Meters
Spoel Washing Machine
Turbidimeter, pH Meter
UV Spectrometer

Hydraulics Laboratory Equipment for Teaching and Research

6[ll] Long Flume
Auger Set For Heterogeneous Soils
Battery Set For e-logger
Bent Spatula
CD Rom with logger data manager
Datalogger Model Datahog 2
e+ infrared communicator
Electronic Balance
Floating Body Apparatus
Fluid Friction Apparatus
Francis Turbine
GPS navigation system
Hand Operated Thetaprobe
Hexagonal socket head screw
Hydrology Apparatus
Hydrostatics & Properties of Fluids Apparatus
Jockey Mass Nozzle Dia
Losses in Piping Systems Apparatus
Mechanical Current Meter with Propeller
Mini Current Meter

Orifice tank
Pelten Wheel Turbine
Pipework Energy Losses Apparatus
Pressure Gauge
Radiation Sensor type SKS 1110
Rain Gauge
Rain Gauge with Tipping Bucket
Reynolds Number Apparatus
Self Recording Sensor/Logger
Software to calculate evapo-transpiration
Soil Moisture Meter
Soil Moisture Sensor Thetaprobe
Steel Hammer
Stop Watch
Toolbag with tools and maintenance material for Meteostation
Universal Drying oven
Venturimeter Board
Volumetric Bed
Vortex Apparatus
Wind Speed Sensor
Wind Vane W200P

6.6 Annexe G: Bibliography

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