

**KWAME NKROMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,  
KUMASI, GHANA**



**IMPROVING WATER RESOURCES MANAGEMENT THROUGH INTEGRATION  
OF COMMUNITY BASED ACTIONS: THE CASE OF BLACK VOLTA BASIN**

**Anowie Francis Xavier**

**MSc. Thesis**

**August, 2012**

**Kwame Nkrumah University of  
Science and Technology**



# **Water Resources & Environmental Sanitation Program (WRESP)**

**Department of Civil Engineering**

## **IMPROVING WATER RESOURCES MANAGEMENT THROUGH INTEGRATION OF COMMUNITY BASED ACTIONS: THE CASE OF BLACK VOLTA BASIN**

**Master of Science Thesis**

By  
**Anowie Francis Xavier, BSc. (Hons.)**

Supervisors  
**Prof. Samuel N. Odai**  
**Dr. Geoffrey K. Anornu**  
**Mr. Frank O. Annor**

**Kumasi**  
**August, 2012**

**IMPROVING WATER RESOURCES MANAGEMENT THROUGH INTEGRATION  
OF COMMUNITY BASED ACTIONS: THE CASE OF BLACK VOLTA BASIN**

By

**Anowie Francis Xavier, BSc. (Hons.)**

A Thesis Submitted to the

Department of Civil Engineering

Kwame Nkrumah University of Science and Technology

in partial fulfilment of requirements for the award of the Degree of

**MASTER OF SCIENCE**

in

**Water Resources Engineering and Management**

College of Engineering

**August, 2012**

## CERTIFICATION

I hereby declare that this submission is my own work towards the M.Sc. and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

Anowie Francis Xavier	_____	_____
<b>(Student, PG 4777210)</b>	Signature	Date

**Certified by:**

Prof. Samuel N. Odai	_____	_____
<b>(Supervisor)</b>	Signature	Date

Dr. Geoffrey K. Anornu	_____	_____
<b>(Supervisor)</b>	Signature	Date

Mr. Frank O. Annor	_____	_____
<b>(Supervisor)</b>	Signature	Date

Prof. M. Salifu	_____	_____
<b>(Head of Department)</b>	Signature	Date

## DEDICATION

I dedicate this work to my mum, my dad, all my siblings and friends, and to all who otherwise can do better than I have, but have not this opportunity!

Special dedication to

The Almighty Jehovah God, the source of my strength...

## ABSTRACT

Community based water resource management focuses on the use of collective actions to manage water resources to improve livelihood of the community. It aims to devolve authority of water management to the local community level by encouraging and empowering communities to adopt actions of their own to manage natural resources in a sustainable manner with some form of external supports be it local government support or foreign donor supports. The study assessed local level water development and management strategies that exist in rural communities and its effectiveness in complimenting water resources management. Data was collected through key informants, interviews, focus group meetings and observations in selected rural communities along the Black Volta in the Upper West region of Ghana, and organisations involved with water resources management. The study reveals that rural communities' only means of livelihood is to exploit the natural resources found within their domain. Rural communities use their long standing social and cultural practices to manage and develop water resources. Rural people respect and use their chiefs, local institutions and cultural beliefs in managing their natural environment and resources. They are aware of the negative consequences that their actions have on water resources and possible remedies required of them. Rural people are however not motivated to put in place and enforce the right measures for sustainable management of water resources when such measures conflict with their means to exploit the environment for survival. They therefore call for joint actions that seek to protect and preserve natural resources and which does not overlook the need for them to survive on the resources that they protect especially where mandated institutions are faced with some challenges to effectively carry their functions. Communities are able to own and sustain any water developmental programme which incorporates their ideas and their physical contributions, right from 'passive participation' where they are informed adequately about any water projects and programmes being undertaken in the community, to 'self-mobilization' where communities do participate by taking initiatives independent of external institutions to change a system. Here they develop contacts with external institutions for resources and technical advice they need but retain control over how resources are used. The communities agree that a fuse of their traditional institutions with the formal institutions will be a better idea to improve water management.

## TABLE OF CONTENTS

<b>CERTIFICATION</b> .....	<b>i</b>
<b>DEDICATION</b> .....	<b>ii</b>
<b>ABSTRACT</b> .....	<b>iii</b>
<b>TABLE OF CONTENTS</b> .....	<b>iv</b>
<b>LIST OF TABLES</b> .....	<b>vii</b>
<b>LIST OF FIGURES</b> .....	<b>viii</b>
<b>LIST OF PLATES</b> .....	<b>ix</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>x</b>
<b>ACKNOWLEDGEMENT</b> .....	<b>xii</b>
<b>CHAPTER 1: INTRODUCTION</b> .....	<b>1</b>
1.1 Background .....	1
1.2 Problem Statement .....	2
1.3 Justification .....	3
1.4 Objectives .....	4
1.5 Scope and Limitation of Study .....	5
1.6 Organization of the Thesis .....	5
<b>CHAPTER 2: LITERATURE REVIEW</b> .....	<b>6</b>
2.1 Water Management and Local Participation.....	6
2.2 Institutions Managing Water and Related Resources in the Volta Basin .....	10
2.3 Integrated Water Resources Management (IWRM) and its Implementation in Africa ..	12
2.4 Indigenous Knowledge in Water Resource Management in Africa .....	15
2.5 Community-Based Actions for Natural Resource Management .....	17
<b>CHAPTER 3: DESCRIPTION OF THE STUDY AREA</b> .....	<b>22</b>
3.1 Overview of the Volta Basin.....	22
3.1.1 <i>Bio-Physical Characteristics</i> .....	22
3.1.2 <i>Socio-Economic Features</i> .....	24
3.2 Study Area .....	25

3.2.1 <i>Physical Characteristics and Population</i> .....	26
3.2.2 <i>Topography and Drainage</i> .....	27
3.2.3 <i>Geology and Soils</i> .....	27
3.2.4 <i>Climate</i> .....	28
<b>CHAPTER 4: RESEARCH METHODOLOGY</b> .....	<b>29</b>
4.1 <i>Research Data</i> .....	29
4.2 <i>Scope of Study</i> .....	29
4.3 <i>Data Collection Methods</i> .....	30
4.3.1 <i>Primary Data</i> .....	30
4.3.1.1 <i>Observation Tour</i> .....	30
4.3.1.2 <i>Interviews</i> .....	31
4.3.1.3 <i>Questionnaire Survey</i> .....	31
4.3.1.4 <i>Focused Group Meetings</i> .....	31
4.3.2 <i>Secondary Data</i> .....	32
4.4 <i>Data Analysis</i> .....	32
<b>CHAPTER 5: RESULTS AND DISCUSSIONS</b> .....	<b>33</b>
5.1 <i>Water Development and Management Practices in Rural Communities</i> .....	33
5.1.1 <i>Water Management Regime in the Rural Communities</i> .....	33
5.1.2 <i>Challenges with Water Development in the Basin</i> .....	35
5.1.3 <i>Water Transport Services</i> .....	37
5.1.4 <i>Local Groups Used For Water Resource Management in the Communities</i> .....	38
5.1.5 <i>Challenges of Water Management and Development Institutions</i> .....	39
5.2 <i>Community Based-Actions for Water and Related Resource Management</i> .....	41
5.2.1 <i>Joint Water Development- Metoyipala Case</i> .....	42
5.2.2 <i>Aforestation Programmes</i> .....	43
5.2.3 <i>Bye-Laws for Water and Related Resources Management</i> .....	45
5.2.4 <i>Joint Water and Related Resources Management-Wachiau Case</i> .....	45

5.3 Cooperation and Collaborations for Water Resource Development and Management in Black Volta Basin .....	47
5.3.1 Cooperation and Collaborations among Local Communities .....	47
5.3.2 Cooperation and collaboration between Rural Communities and State Water Institutions.....	49
5.3.3 Dispute and Conflict Resolutions.....	51
5.4 Impact of Communities' Livelihood on Water Resource Development and management .....	53
<b>CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>55</b>
6.1 Conclusions.....	55
6.2 Recommendations.....	56
<b>APPENDICES.....</b>	<b>64</b>
APPENDIX A: SURVEY QUESTIONNAIRE.....	64
APENDIX B: Population by District and Sex – Upper West Region .....	69

## LIST OF TABLES

Table 2.1: The Dublin Principles on Water and Sustainable Development .....	7
Table 2.2: Community Participation Framework .....	9
Table 2.3: Natural Resource Management Alternatives.....	17
Table 2.4: Key Actors Required for CBNRM Activities .....	19
Table 3.1 Population Distribution (Volta Basin Countries) .....	24
Table 5.1: Sources of Water in the Communities.....	38
Table 5.2: Some community-based actions in the Black Volta Basin.....	41

## LIST OF FIGURES

Figure 3.1: Inter Annual Average Rainfal in the Volta Basin .....	23
Figure 3.2: Volta Basin Showing the Study Area .....	25
Figure 3.3: The Study Area .....	26
Figure 5.1: Relevance of Traditional Customs in Modern Times for Water Management.....	34
Figure 5.2: Communities' preference for finance of water development projects.....	42
Figure 5.3 Cooperation between Ghana and Burkina Faso communities on the use of the Black Volta River.....	47
Figure 5.4 Community Members' Knowledge of the WRC and its Functions .....	50
Figure 5.5 Communities' preference of institutions for water management.....	52
Figure 5.6: Preferred choice for water conflict resolution in the communities.....	52

## LIST OF PLATES

Plate 4.1 Tour at Ongbile dam site (Metoyipala) with selected members of the youths.....	30
Plate 4.2 River tour at Talawona (Wachiau) to inspect activities at the river banks.....	30
Plate 4.3 Interview with the Chief (Bagri Zongo community).....	32
Plate 4.4 Focus group meeting with women at Baase community.....	32
Plate 5.1: River bank garden at Metaw Yepala.....	35
Plate 5.2: Flood plain erosion at Bagri-Zongo.....	35
Plate 5.3: Bush burning at Talewona.....	36
Plate 5.4: A typical fish trap at Talawona.....	36
Plate 5.5: Dilapidated canoe used for water transport (Zupuri community).....	37
Plate 5.6: A child canoe porter transporting children and goods (Char-Batan) community)...	37
Plate 5.7: Ongbile earth dam (dugout).....	43
Plate 5.8: Typical plot for household as shown by the newly placed stones in this.....	43
Plate 5.9: Aforestation programme in Zupuri.....	44
Plate 5.10: Trees that have not thrived well.....	44
Plate 5.11: Interview with a tour guide (Hippo Sanctuary Board, Wachiau).....	46
Plate 5.12: Paramount Chief of Wachiau (middle).....	46

## LIST OF ABBREVIATIONS

AWF	African Water Facility
AWTF	Africa Water Task Force
CBNRM	Community Based Natural Resource Management
CWSA	Community Water and Sanitation Agency
DGRE	Directorate General for Water Resources
ECOWAS	Economic Community of West African States
GEF	Global Environmental Facility
EPA	Environmental Protection Agency
GSS	Ghana Statistical Service
GWCL	Ghana Water Company Limited
GWP	Global Water Partnership
HSD	Hydrological Services Department
HYCOS	Hydrological Cycle Observing System
ICWE	International Conference on Water and the Environment
IDA	Irrigation Development Authority
IFAD	International Fund for Agricultural Development
INBO	International Network of Basin Organizations
IWRM	Integrated Water Resources Management
MOFA	Ministry of Food and Agriculture
MSD	Meteorological Services Department
MWRWH	Ministry of Water Resources, Works and Housing
NGO	Non-Governmental Organizations

PAGEV	Project for Improving Water Governance in the Volta Basin
SGP	Small Grant Program
TDA	Transboundary Diagnostic Analysis
UN IWC	United Nations International Watercourses Convention
UNDP	United Nation Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environmental Programme
VBA	Volta Basin Authority
WRC	Water Resource Commission
WRI	Water Research Institute
WRM	Water Resource Management

## ACKNOWLEDGEMENT

I am most grateful to JEHOVAH GOD, for granting me good health, wisdom and persevering attitude to begin and end this piece of work.

Without my mum, dad and my siblings, I wouldn't have endured this difficult task. I call for God's favour and love for all of you.

My profound gratitude also goes to my supervisors Prof. S. N. Odai, Dr. G. K. Anornu and Mr. F. O. Annor, who served as my guide and counsel to put this piece together. You really inspired and encouraged me with your insightful advice. I pray that you increase in wisdom to continue to turn out more successful students. I wish to thank all the lectures of the Water Resources and Environmental Sanitation Program (WRESP), KNUST. Every bit of knowledge I gained from you has made me this whole.

I am also thankful to the Global Water Initiative (GWI)–Ghana program, being implemented by a consortium of Catholic Relief Services (CRS) and CARE Ghana, which has supported financially this collaborative research with KNUST-WRESP.

Last but not least, I express special thanks to my research assistants, Mr Abel, Mr Steven from Lawra district, Mr Kofi from Nadowli district, and to the entire respondents including Chiefs and people of all the communities and hardworking officials from various institutions, who allowed me to collect from them this invaluable information. To all my friends and well-wishers, who have supported and encourage me with prayers, the Good Lord Almighty will bless you all.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Water, dependent on how it is managed, may become a vessel for social and economic development, or a source of conflict between and among Communities or States in a local or transboundary Basin. Earlier research (Iza and Stein, 2009) demonstrates that ‘How a country manages its water resources determines the health of its people, the success of its economy, the sustainability of its natural environment, and its relations with its neighbours.’ Chen (2008) has demonstrated that ‘Forming Institutions and coordinating the integrated management of a River Basin at the Inter-State level is important, but most crucial is whether policies and management plans developed involves the community-based actions adequately.’

Rural communities in Africa are home to most of the world’s poorest people, who depend greatly on the exploitation of natural resources. Africa has about 59% of its poor people living in rural areas, depending primarily on agriculture for food and livelihood (Hope, 2009). Water management remains a central priority for rural people in developing countries, which depends heavily on rain fed agriculture. There exist a clear link between rural livelihood, water and global poverty reduction efforts. In rural communities land and water are two key assets on which poor people depend for livelihood. Water is part of the natural capital base that underpins the production systems that sustains livelihood (UNDP, 2006).

Water use in most Sub-Saharan Africa countries is governed by customary right and formal right (UNDP, 2006). Rural communities in the Volta basin employ flexible institutional arrangements including the use of taboos and other cultural practices to protect natural resource including water resource over the years (Opoku-Ankomah et al., 2006).

The social settings of an environment determine which rules and practices can provide best results. The Volta Basin Authority (VBA) established in 2006, is the holistic Transboundary legal framework for managing the Volta Basin. It is currently faced with some challenges including member States defaulting in paying their financial contributions and human resource challenges. Cote d'Ivoire is yet to ratify the convention (AWF, 2010; Ampomah et al., 2008).

Community based water and related resources management is based on the use of collective actions to manage water resources so as to improve and sustain the natural environment and the well-being of rural dwellers. It aims to devolve authority of water management to the local community level by encouraging and empowering communities to adopt actions of their own to manage natural resources in a sustainable manner with some form of external supports.

Local communities in the White Volta Sub-Basin of the Volta Basin under the “Project for Improving Water Governance Basin in the Volta Basin (PAGEV)” have engaged afforestation on flood plains and along their stretches of the bank. This community-based initiative serves to prevent encroachment on the river banks, and also it is a means of preventing flooding which is becoming a seasonal occurrence in that region. The high level of community participation (through labour and provision of local materials) in the PAGEV project is an indication that rural communities, given the opportunity could help in the sustainable management of natural resources (Kogo, 2009).

## **1.2 Problem Statement**

Africa's Transboundary water resources are less developed than those in the other parts of the world (UNECA, 2000). In Ghana, laws and regulations established for the management of

water and related resources are either weak or ineffective or not adequately enforced due to lack of institutional capacity or political will (Andah and Gichuki, 2005).

With the high growth rate of 2.54% in the Volta Basin, population is expected to grow from over 18million in 2000 to over 33 million (80% increment) in just 25 years. Population in the basin is generally rural, in the range 64-84% for basin countries. Overuse and misuse of land resources in the basin have resulted in decreased runoff and degraded water quality and other threats to the integrity of the ecosystem. Annual deforestation rate is 2.5-5% in the basin. The overwhelming majority of the population of the Black Volta Sub-Basin depend on rain fed farming for their livelihood which is becoming more precarious and less reliable due to climate change leading to poverty and migration of rural people from the northern part of Ghana to the southern part (GEF-UNEP, 2002).

Indigenous arrangement for natural resources management, in particular water resources, continue to play a very important role in Africa but are rarely appreciated and acknowledged (Opoku-Ankomah et al., 2006). At local community level water governance structures already exist, but are systematically not recognized at higher institutional levels. Initiatives solely sponsored and run by local communities to promote transboundary cooperation in the Volta basin are rarely known or well documented, although commercial trade between the borders has been well established over many decades (Ampomah et al., 2008).

### **1.3 Justification**

Poor water resources management has stimulated and sustained a number of problems related to health, socio-economic and environment, which need to be solved (Dungumaro and Madulu, 2002). Conflict largely arises at the local and community levels thus to effectively avoid it and address future water management needs, there is the need to understand how

local knowledge could be a source of input (Carius et al., 2004). Ignoring local knowledge could be detrimental to water resource management but building on it is crucial for easy implementation of water development programme.

The more community-based organizations, actions, can become official and accepted by basin organizations, local government and government institutions, the more communities become empowered to improve their level of representations in water resource management which invariably enhances their participation in water governance. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels (Dublin Statement, 1992).

Local approaches for the management of water resources promise benefit beyond those associated with purely regulatory approach. Community-based arrangements tend to empower peoples own initiatives in self-management of natural resources, have pro poor attributes desires in principle, supports and promotes small-scale local communal resource management and are enforceable (Van Koppen et al., 2007; Mehta et al., 1999).

#### **1.4 Objectives**

The study seeks to improve water resources management in the Black Volta Sub-Basin with the incorporation of community based actions into current practice.

The following are the specific objectives:

- Identify water development and management practices at local level in the Black Volta Basin
- Assess gaps between local communities and formal water institutions in the development and management of the Black Volta River and propose solutions for them.

## **1.5 Scope and Limitation of Study**

The research looks at rural communities' contributions and actions that impact on water and related resources management in the Black Volta Basin. It is restricted to riparian communities that are closest to the Black Volta River in the Upper West region of Ghana. It is more of a qualitative research that seeks to find out rural communities social reasons and influences to water resources management. One major limitation is language barrier between researcher and the respondent.

## **1.6 Organization of the Thesis**

This thesis has six chapters. Chapter One, introduces the study by providing problem statements; justification; objectives and the scope and limitation. Chapter Two then provides the literature review relevant to the study. It looks at water management and local participation, and some of the Institutions for the management of water and related resources in the Volta Basin. The chapter attempts to define indigenous knowledge and community based natural resources management, and points out their suitability for water management in legal pluralistic communities. Chapter Three looks at the general overview of the Volta River Basin and then zero in to the study area. Chapter Four which is the Research Methodology describes the methods and processes used to collect data for the study. Chapter Five presents and discusses the research results. The final chapter, Chapter Six provides the major findings, conclusions and recommendations drawn from the study.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Water Management and Local Participation

Water management dates back to ancient times when stone rows and ditches were used for irrigation and later aqueducts were built to carry water from source to points of need. The purpose of water management has changed from the past where the concern was the means to get water for domestic consumption, hydro-power generation and irrigation, to current dispensation where water management is not only for delivering water services, but doing so in a way that balances the competing interests of individuals, industry, agriculture and wildlife. It is also to maintain good relations between all the users who share water resources and develop systems that will accommodate future generations (Iza and Stein, 2009).

There is a general agreement that effective water governance which has a direct link with stakeholder participation is a necessary part of the solution to the challenge of managing the water ecosystem under the current influence of climate change. Water governance has social dimension (equitable use), economic dimension (efficient use), environmental dimension (sustainable use) and political dimension (equal democratic opportunities) (Salame et al., 2009).

Water governance covers the manner in which allocative and regulatory politics are exercised in the management of water and other natural resources and broadly embraces the formal and informal institutions by which authority is exercised (Batchelor, 2007). Participation is the basis for commitment to, and coherence in, implementation of effective water governance (Iza and Stein, 2009).

**Table 2.1: The Dublin Principles on Water and Sustainable Development**

- I. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- II. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
- III. Women play a central part in the provision, management and safeguarding of water.
- IV. Water has an economic value in all its competing uses and should be recognized as an economic good.

**Source: Global Water Partnership-Technical Advisory Committee, 2000**

The critical issue is not to centralize or decentralize institutions, but to coordinate the work of the different water management sectors with a common vision (Iza and Stein, 2009). Evidence of successful self-governance of natural resources by the local users themselves has engendered considerable optimism that devolving responsibility over to organized local communities will improve the efficiency, equity, and sustainability of the resource base and also reduce the financial burden on the state and its institutions (Meinzen-Dick and Knox, 1999). Restructuring national, legal and institutional frameworks must be subjected to processes in reaching agreement that require the active participation of all water stakeholders (Iza and Stein, 2009).

Ghana is a signatory to a number of International laws, protocols, agreements and declarations that place obligations on the government in the management of water resources and the environment. The transboundary process concerning the Volta River Basin is also formally recognized in Ghana's National Water Policy. These laws, protocols and agreements place obligations on the government in the use of water resources particularly with the cooperation of other riparian states (Ampomah et al., 2008, Ministry of Water Resources Works and Housing, 2007).

In Ghana and other African countries like South Africa, new reforms have placed water resources in the hands of the states. The aim is to create a unified legal framework for government to allocate water rights with limits of environmental sustainability so as to treat water resources in an integrated fashion (UNDP, 2006). The strong role of the state in water policies does not rule out more participation of the poor in decision-making, nor the decentralization of national policy to the local level (Brauer, 2002).

It must be recognized that the stakeholders involved in water management, especially International Basins, are not homogeneous states, but specific groups and individuals who make up the State. Stakeholders include national and sub-national government bodies, water users and communities where the resources are. An understanding of the different interests and motivations of the various stakeholders and the political-economic factors that influence these is therefore required.

Since issues related to water basin management could be solved at regional, national, and community level, how to integrate the various levels of governance to maximize the benefits of the resources without compromising the sustainability of the ecosystem is critical (Chen, 2008). Dungumaro and Madulu (2002) like many others agree that in order to have effective water resource management, it is crucial to strengthen local communities' involvement in identifying problems that affect them and strategies to solve them.

Public participation enhances the legitimacy of effective water governance. Subsidiary principle requires that policy decisions should be made at the most local level possible, without losing sight that local areas are parts of larger systems and do not exist in isolation (Devuyst, 2001). Chen (2008) is of the view that how we incorporate local communities in transboundary water management, and effectively implement regionally developed policies

and management plans at the community level determines the success of sustainable water resources management.

**Table 2.2: Community Participation Framework**

Type of Participation	Characteristics
Passive participation	People participate by being told what is going to happen or has already happened. It is a unilateral announcement by an administration or project management without listening to people's responses. The information being shared belongs only to external professionals.
Participation in information giving	People participate by answering questions posed by extractive researchers using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings as the findings of the research are neither shared nor checked for accuracy.
Participation by consultation	People participate by being consulted, and external people listen to views. These external professionals define both problems and solutions, and may modify these in the light of people's responses. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.
Participation for material incentives	People participate by providing resources, for example labour, in return for food, cash, or other material incentives. Much on-farm research falls into this category as farmers provide the fields but are not involved in the experimentation or the process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
Functional participation	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated social organization. Such involvement does not tend to be at early stages of project cycles or planning, but rather after major decisions have been made. These institutions tend to be dependent on external initiators and facilitators, but may become self-dependent.
Interactive participation	People participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives and make use of systematic and structured learning processes. These groups take control over local decisions and so people have a stake in maintaining structures or practices.
Self-mobilization	People participate by taking initiatives independent of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Such self-initiated mobilization and collective action may or may not challenge existing inequitable distributions of wealth and power.

Increasing Participation



**Sourced from Reid et al. (2009) who adapted it from Adnan et al. (1992)**

## **2.2 Institutions Managing Water and Related Resources in the Volta Basin**

The main institution in charge of managing and regulating the development of water resources in the Volta basin is the Volta Basin Authority (VBA). The VBA was created in 2006, with the view to promoting permanent consultation tools among the parties for the development of the basin as well as to promote the implementation of IWRM. It is also mandated to authorize the development of infrastructure and projects that could have substantial impact on the water resource in the basin (Volta- HYCOS, 2006).

There are other bilateral and multilateral agreements among the riparian countries. Between 1957 and 1996, were two international agreements in connection with the Volta's waters: the 1962 agreement signed by Togo and Benin to purchase electricity (to be generated at Akosombo dam) from Ghana and the 1973 multilateral agreement signed by all six riparian to control the spread of Onchocerciasis in the basin (Lautze et al., 2006: AWF, 2010).

Ghana and Burkina Faso are the major players in the basin since in sum they account for more than 83% of the total land area of the basin. In July 1998 a Permanent Technical Committee to focus on the study of power generation, irrigation, water transport, and the control of water-borne diseases, especially in the Volta Basin was formed by the two countries. This precedes Burkina Faso's request for 'no objection' from Ghana for a water supply scheme on the Ziga Dame on the White Volta/Nakambe in Burkina Faso which brought about the first existing 'formal agreement' on water use on the Volta between Ghana and Burkina Faso (Ampomah et al., 2008).

The basin states still have the prerogative even after the formation of the VBA, to enter into any bilateral and multilateral agreement. Article 5 of the VBA convention specifies that "parties may enter into agreements on any portion of the Volta basin as long as such

agreements shall be consistent with provisions of the Convention” (AWF, 2010). Co-operation efforts among riparian countries in the Volta basin, has largely been initiated and driven by International Agencies, e.g. the World Bank to satisfy lending conditions and on projects, often not serving the countries’ interest (Ampomah et al., 2008).

In the riparian countries, there are other internal institutions in charge for managing water and related resources. The Ministry of Water Resources, Works and Housing (MWRWH) is the parent ministry in Ghana with overall responsibility for the water supply sector. Water Resources Commission (WRC) is the leading institution involved in water resources management in the country. WRC established through Act of Parliament (Act 522 of 1996) is the overall body responsible for coordination, regulation and management of Ghana’s water resources. Part of its mandate is to undertake activities for the protection of catchments. Section 12 of the WRC Act (1996) vests the ownership and control of water resources in the President on behalf of, and in trust for the people of Ghana (Barry et al., 2005).

The most important institutions in Ghana that provide water for domestic consumption are the Ghana Water Company Limited (GWCL) (formally Ghana Water and Sewerage Corporation) and the Community Water and Sanitation Agency (CWSA). The GWCL has the mandate to develop, manage and control drinking-water supply in the urban centres of the country. The CWSA was created to facilitate the provision of water for rural areas in Ghana. The Volta River Authority (VRA) and the Ghana Irrigation Development Authority (GIDA) are other important water users in Ghana. VRA uses raw water to produce electricity and the GIDA develops and manages irrigation and associated land use for agricultural production.

The Ghana Meteorological Agency, Hydrological Services Department (HSD) and the Water Research Institute (WRI) were set up for data collection and management. Another important

institution under the Ministry of Environment, Science and Technology is the Environmental Protection Agency (EPA). The EPA has the responsibility to protect and improve the environment against pollution (Barry et al., 2005; Opoku-Ankomah et al., 2006).

Burkina Faso has similar institutional structure to Ghana. The Directorate General for Water Resources (DGRE), a directorate of the Ministry of Agriculture, Hydraulics and Halieutic Resources is in charge of water resources management in Burkina Faso and the establishment of a relevant information system. It is responsible for monitoring the use of water resources, ensuring the regular functioning of the hydrometrical and piezometric stations, centralizing and processing hydrological and hydro-geological data collected on the whole hydrographical basin, coordinating and seeing to the preparation of all publications on water resources and conducting all hydrological, hydro- geological and hydro-meteorological studies needed to provide information on the river systems (Volta- HYCOS, 2006).

### **2.3 Integrated Water Resources Management (IWRM) and its Implementation in Africa**

To ensure sustainability and efficiency of water use in the future, many including Mondello (2006) have called for the implementation of IWRM. IWRM is defined as a “process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP, 2000). IWRM seeks to reconcile basic human needs, ensure access and equity with economic development not overlooking the integrity of the ecosystem (Van der Zaag, 2005).

The early 2000s saw several countries in Africa incorporates IWRM concept into formal government structures. Prior to the introduction of IWRM concept, social and economic development and water resource management tended to be fragmented, uncoordinated, top-

down approach by sectoral institutions (GWP, 2000). The concept of IWRM has been accompanied by promotion of the river basin as the logical geographical unit for its practical realization. Ghana set up a Water Resources Commission with a cross-sectoral mandate.

The Ghana Water Act (1998), the South African Water Act (1998) and Mali's 2007 Water Code, among others, take an integrated approach. Burkina Faso completed an IWRM Plan in 2003. Kenya, Malawi, Mali, Senegal and Zambia completed plans in 2008, and Benin, Cape Verde, Eritrea, Mozambique and Swaziland are all in the process of developing similar plans (GWP and INBO, 2009).

Different institutions and researchers have questioned the practicability of the concept and definition as too complex to understand and difficult to implement (Biswas, 2004; Agyenim and Gupta, 2011). Every change is met with challenges and with challenges are opportunities. IWRM provides a solid framework for thinking systematically about a future in which water use is ecologically sustainable, socially equitable and economically efficient (Salame et al., 2009). Implementation of IWRM depends largely on how it is defined and what are the variables and institutions to be integrated (Dungumaro and Madulu, 2002).

IWRM concept has brought about many reforms in Africa especially the creation of new institutions and proper inter-sector coordination but had offered little explanation regarding how the institutions can effectively engage with stakeholders at different levels (Fatch, 2009). Although IWRM emphasizes the need for improved governance of water resources through the participation of various stake holders by adopting the subsidiary principle in water management (GWP, 2000; ICWE, 1992), the conceptualization and implementation of local participation at the transboundary level remains unclear (Fatch, 2009).

In Ghana IWRM is based on the basin scale-approach where basin boards manage their respective basins and WRC is in charge of coordinating at the national level. Stakeholder participation is mostly seen at the governmental institution level with limited local institutions involvement (Agyenim and Gupta, 2011). The institutions mandated to spearhead the implementation of IWRM in the Volta basin is the VBA. The December 2000 ECOWAS summit declaration on IWRM provided the highest sub-regional political justification to the Volta Riparian states to forge towards a holistic water governance institutional framework for the Volta basin (AWF, 2010).

Although there is special platform for stakeholder participation in the Volta basin, provision for direct involvement of local communities in water projects is non-existent (Dzakpasu, 2008). Within the limits of a basin, it is not an easy task to integrate land uses and water management. This is because land management, which covers planning, forestry, industry, agriculture and the environment, is usually governed by policies not connected to water policy and is managed by many different parts of an administration (GWP and INBO, 2009).

Many researchers agree on the importance of local community involvement in IWRM; however their level of involvement is still low in most developing countries (Dungumaro and Madulu, 2002). Integrated approach that disregards or overlooks the local community actions and concerns for water managements aims to achieve very little in terms of addressing implementation challenges to water resources management in a basin. Van der Zaag (2005) is of the view that achieving IWRM requires that there are transparency and all-inclusiveness in decision making process. He cites institutional dimension, decision process and upstream-downstream linkages as some of the key challenges that hinder its smooth implementation. For institutional challenges he prescribes that new water organizations should primarily serve

as consultative bodies ensuring consistency in development throughout the basin rather than merely having executive functions.

Recently the confidence with which IWRM was promoted has started to fade away especially in sub Saharan Africa. Some critics believe that IWRM may work in the formalized water economies in the industrialized countries and not the informal water economies of developing countries. There is a renewed and growing call for a new vision of a more refined role for states, and other players in water resource management in informal sectors in developing countries, that allows community- based arrangements to play their full roles (Shah and Van Koppen, 2006; Koppen et al., 2007).

#### **2.4 Indigenous Knowledge in Water Resource Management in Africa**

African customs and traditions have been perceived for a long time to be irrational and incompatible in coping with present needs and challenges for a long time. However proponents of indigenous knowledge believe that indigenous knowledge is the single largest knowledge resource yet to be mobilized and utilized for its developmental enterprise (Nwaka, n.d.). Gadgil et al. (1993) defines indigenous knowledge as “body of knowledge and beliefs handed down through generation by cultural transmission about the relationship of living beings (including humans), with one another.”

Indigenous knowledge belongs to a particular group of people with similar social settings and beliefs. It is the guiding principle for decision-making in areas including agriculture, health, natural resource management, in local communities (Kogo, 2009). Where local people have depended on the natural environment for their livelihood, they have always developed a stake in conserving and enhancing the biodiversity for its sustainability. Indigenous people have

always been aware that biodiversity is a crucial factor in generating the ecological services and natural resources on which they depend for survival (Gadgil et al., 1993).

The loss of indigenous knowledge for water resource management according to Kogo (2009) includes the inability and ineffective means to transfer such knowledge (verbal transfer from generation to generation) and also as a result of globalization and public influences associated with changes in political and economic landscape in the Volta basin. Allan and Curts (2003) shares the opinion that; to engage local communities meaningfully in adaptive water basin management requires that, local communities possess the right knowledge, skills, attitude and motivation to carry out their roles.

Indigenous knowledge base is indefinite and their implementation involves an intimate relationship with the belief system of local people and is difficult for western science to understand (Gadgil et al., 1993). Between local community members and professionals are sometimes mistrust when it comes to accepting reliability of local and scientific knowledge. Local communities often have little confidence in the reliability of information from scientists, whilst scientists are equally often reluctant to trust local knowledge. Local knowledge is seen as being subjective and lacking in rigor (Gaillard and Maceda, 2009 cited in Reid et al., 2009). One truly African value is that not any one person can claim to know what the right solution to a problem is. The agreed solution based on consensus of all interested stakeholders is the right solution (Van der Zaag, 2005).

Building on local knowledge is crucial for water resource management. Ignoring local knowledge would not foster participation and ownership of developments projects and programs. Sometimes ignoring local knowledge has resulted in selection of tree species for water source protection which could not thrive well in the communities. Indigenous

knowledge needs to be recognized as a strong basis for building lasting change in water governance. Water issues are inherently local; therefore local-level water data should be made available to decision makers, whether they are working at the local, state, or national levels (Bliss and Bowe, 2011). The spread of community-based conservation and natural resource management initiatives has sought to rediscover the virtues of indigenous knowledge, promoted small-scale local communal resource management and empower local peoples own initiatives for water and related resource management (Mehta, 1999).

## 2.5 Community-Based Actions for Natural Resource Management

Natural resources are a means of livelihood for rural communities and a foundation for overcoming rural poverty. Clear understanding of activities of rural communities with respect to natural resources use, their capacity to manage them effectively and the institutional environment in which natural resource management strategies are designed and implemented have a greater role in overcoming rural poverty and ensuring its sustainable use (IFAD, 2006).

**Table 2.3: Natural Resource Management Alternatives**

**Public Sector Management:** State institutions, including ministries, departments or agencies of the bureaucracy, make and enforce decisions about resource use (sometimes referred to as command and control)

**Private Sector Management:** Private individuals or companies with ownership rights make decisions about resource use within limits set by (state) law (sometimes referred to as market based)

**Local Community-Based Management:** Community institutions with de jure or de facto ownership or use rights determine and administer access and use

**Open Access:** No one has de facto ownership of the resource in question. A resource under open access belongs to whoever is the first to exercise control over it.

**Adapted from: The World Bank, 1999**

Present events show that natural resource management is caught up between two contradictory processes. At one level is the globalization of the processes through adoption of

international conventions, laws and structures of fiscal discipline, yet at a more local scale is a call for schemes that would increase local participation (Mehta, 1999). Penetration of the state and its institutions in rural areas are generally weak (Van Koppen et al., 2007). Management of natural resources solely by governments and its agencies could be expensive and ineffective (Meinzen-Dick and Knox, 1999).

Collective action is a key factor to understand community-based natural resource management (CBNRM). Collective action refers to concerted action by groups of people that share a common interest, perceive that interest and act to achieve it. Collective action often based in specific local institutions (local community), focuses around specific issues, and make use of a given set of tools or means in order to arrive at specific goals (that cannot be achieved individually), and/or to maintain a specific state (The World Bank, 1999).

Collective actions also could be an adoption of rules for engagement by a local group in the management of a natural resource. Such institutions for water resource management commonly known as Community-based water law is defined by van Koppen et al. (2007) as the set of mostly informal institutional, socio-economic and cultural arrangements that shape communities' development, use, management, allocation, quality control and productivity of water resources. These arrangements, anchored in the wisdom of time, are embedded in local governance structures and normative frameworks of kinship groups, smaller hamlets, communities and larger clans and groupings with common ancestry. In the case of natural resource management, it might include rules that allows or refrain community members from using a resource (Ostrom, 1992).

Collective action in the context of CBNRM refers to the co-management of, and responsibility for, specific natural resources. The use of bureaucratic approaches and attitudes

are often not conducive to encouraging sustained collective action among resource users. Collective action is sustained over time and can play a significant role in reducing costs through effective organization, providing each user with the confidence to contribute, (The World Bank, 1999; Meinzen-Dick and Knox, 1999). Collective actions are required from all relevant stakeholders to make CBNRM work efficiently

**Table 2.4: Key Actors Required for CBNRM Activities**

**1. Catalytic Organizations (often NGOs)**

- Advocate, facilitate, and (often) initiate and pilot change
- Help mobilize people and build capacity at the local level
- Provide political cover for politicians

**2. Community Leaders**

- Representative and active participants in the reform process
- Beyond consultation to collaboration and empowerment

**3. Reform Managers**

- At both the central and local levels
- Help mainstream successful pilots

**4. Politicians and Senior Policy-Makers**

- Provide political commitment
- Validate consensus and confirm strategic direction

**Adapted from: The World Bank, 1999**

CBNRM is characterized by a situation where the control over natural resources is transferred more or less completely to communities. The communities play central role in identifying resources, defining development priorities, choosing and adapting technologies, and implementing management practices (Meinzen-Dick and Knox, 1999; Carson, 1998). Pretty and Guijt (1992) cited in Leach et al. (1999), also defines CBNRM as a process by which local communities organize themselves with some external supports so as to apply their skills and knowledge to take care of natural resources and the environment while satisfying livelihood needs.

Approaches to CBNRM appears as diverse as their varied implementing agencies and natural resources settings even though they rest on set of common assumptions about the community environment and the relationship between them (Leach et al., 1999). Essential feature of CBNRM is starting with communities, taking them into confidence and having confidence in them through engaging their ideas, experiences, values and capabilities on behalf of resource conservation objectives, without compromising on its benefits to the communities (Uphoff, CBNRM workshop presentation cited in The World Bank, 1999).

CBNRM remains a touchstone for much of rural development and sustainable natural resources management. It has gained international prominence and is now being promoted by most major international funding institution, since the early 1990s, to complement for natural resource management (Blaikie, 2006). Community-based arrangements for water resource management are incentive for collective actions (van Koppen et al., 2007). CBNRM in all various forms is an established policy goal for rural development, even though the rationale and concept behind it has been around a long time ago among rural dwellers Blaikie (2006).

CBNRM was the focus of over 80% of International Fund for Agriculture Development (IFAD) approved programme for 2000-2004 (IFAD, 2006). The Global Environmental Facility's (GEF) Small Grant Programme (SGP) since 1992 has been adopting community-based actions to address global environmental concerns: biodiversity conservation, climate change mitigation, protection of international rivers and prevention of land degradation. The SGP has 101 country programmes in developing countries, and had funded more than 8190 community-based projects worldwide as at March 2007, targeting disadvantaged and poor communities. In the Nile River basin, GEF's SGP experimented a partnership with an inter-governmental regional initiative in implementing community-based activities in Nile River Basin, bringing community-based experiences into decision-making processes (Chen, 2008).

Despite the positives that come with CBNRM, others believe it rides on a heterogeneous set of theories and sentiment (Blaikie 2006). Advocates of community-based resource management usually points to inadequate government capacity for direct management of the resources at the local level (Meinzen-Dick and Knox, 1999). They however fail to look at the capacity of local communities to sustain such efforts. CBNRM often makes most of its promises to deliver natural resource management than to assist the community (Blaikie 2006). Uphoff (CBNRM Workshop Plenary Presentation 1998 cited in The World Bank, 1999) indicates that “CBNRM assumes that local people understand and will support larger interests and principles of conservation, factoring these into their economic, social and cultural considerations about how natural resources should be managed”.

CBNRM has sometimes operated with no formal legal underpinning. Where community-based management efforts are subject to challenge from outside or within, the formal legal arrangement is relevant (Lindsay CBNRM Workshop Plenary Presentation, 1998 cited in The World Bank, 1999). Objectives of community management are to strengthen their management capacity and create opportunities for them. Management capacities of communities can be built successfully when there is clear understanding of the social, economic and cultural characteristics of the community. Through training and provision of basic tools, communities could implement conservation activities to protect their livelihood.

The more community-based organizations can become official and acceptable by basin organizations, local government and governments and its institutions the easier and more efficient would be natural resource management at the local community level which would lead to enhanced local participation and improved livelihood for local communities. “Community based natural resource management is an evolving agenda and involves much learning by doing” (The World Bank, 1999).

## CHAPTER 3

### DESCRIPTION OF THE STUDY AREA

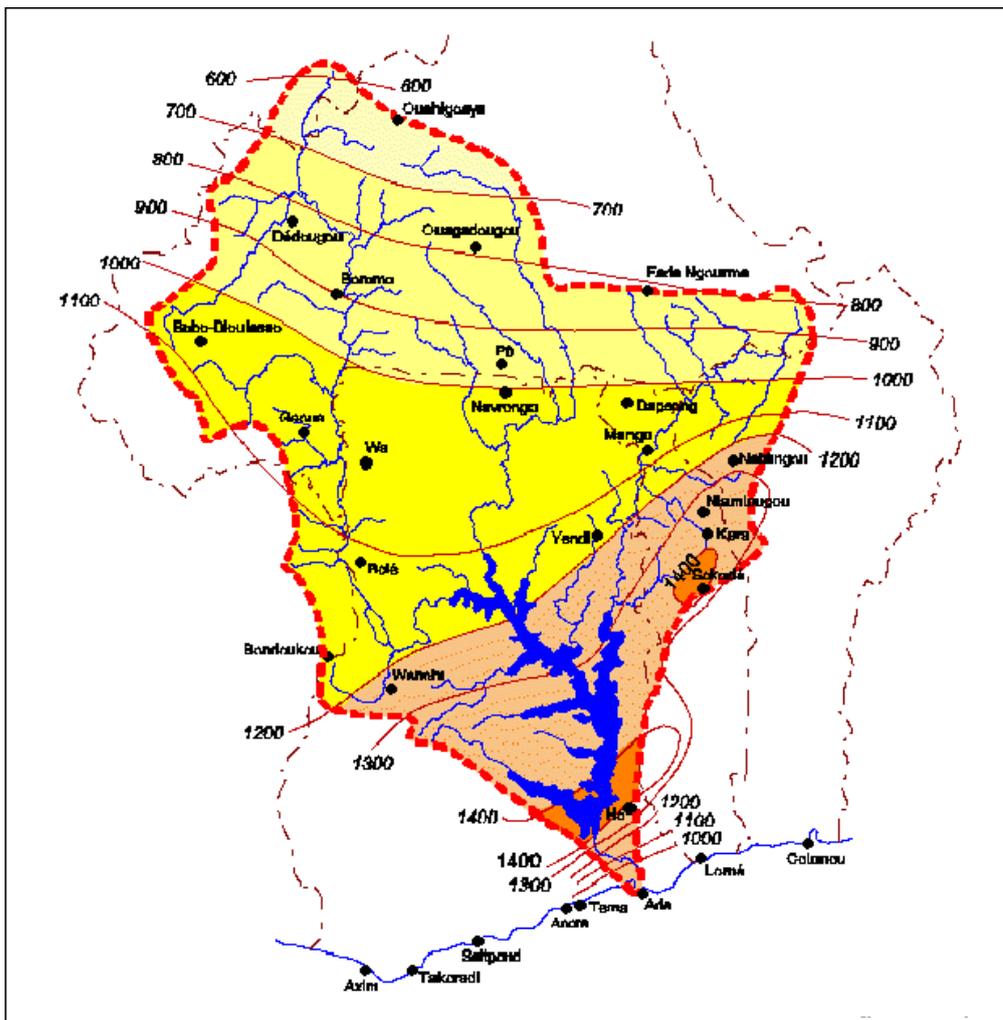
#### 3.1 Overview of the Volta Basin

##### 3.1.1 Bio-Physical Characteristics

The Volta Basin is located in West Africa and lies within latitudes 5° 30 N and 14° 30 N and longitudes 2° 00 E and 5° 30 W. The Basin lies within six (6) riparian countries with land area proportion as follows: Burkina Faso (42.6%), Ghana (40.2%), Togo (6.4%), Benin (4.1%), Mali (3.7%) and Côte d'Ivoire (3.0%). The Volta River stretches over 1850 km long within a basin of 400000 km<sup>2</sup> and flows into the Atlantic Ocean at Ada. The Volta Basin covers almost the whole Southern part of Burkina Faso and almost the whole Northern part of Togo before occupying the greater part of Ghana (Volta HYCOS, 2006: Andah and Gichuki, 2005). The basin can be subdivided into smaller basins belonging to its major tributaries, the Black Volta (147 000 km<sup>2</sup>), the White Volta (106 000 km<sup>2</sup>), the Oti (72 000 km<sup>2</sup>), and the Lower Volta referring to the river downstream of the confluence of the Black Volta and White Volta and Lower Volta (73 000 km<sup>2</sup> that includes Lake Volta-among the world's largest artificial lakes) (Andreini et al., 2000).

Climate of the Volta Basin is controlled by two air masses: the North-East Trade Winds and the South-West Trade Winds. The North-East Trade Winds is dry (the Harmattan) and blows from the interior of the continent. The South-West Trade Winds (the monsoons) is however moist because it blows over the seas. The inter-phase of these two air masses is called the Inter-Tropical Convergence Zone (ITCZ). There is a lot of convective activity in the region of the ITCZ, hence the associated considerable amount of rainfall in that region. The ITCZ moves northwards and southwards across the basin from about March to October when rainfall is received in the region (Barry et al., 2005). Rainfall figures between 1951 and 1989 shows that it varies widely across the basin.

In the Burkina Faso part of the basin, rainfall varies between 500 mm and 1000 mm, whilst in the Ghana and Togo part of the basin the range is between 1000mm to 1500 mm (Volta HYCOS, 2006). The three types of climatic zones identified in the region: the humid south has two distinct rainy seasons, the tropical transition zone has two seasons of rainfall very close to each other and the tropical climate, north of latitude 9° N, has only one rainfall season that peaks in August (Barry et al., 2005; GEF, 2002).



**Figure 3.1: Inter Annual Average Rainfal in the Volta Basin**  
**Source from: Volta HYCOS, 2006 which was adapted from ORSTOM**

The Volta Basin has an annual mean temperatures between 27°C and 30°C. Daily temperatures can be as high as 32°C - 44°C and night temperatures as low as 15°C. Humidity varies between 6% and 83% depending on the season and location. Generally temperatures

are higher upstream of the basin and decreases downstream. Potential Evapotranspiration in the basin varies both spatially and temporally with an annual mean varying from 2500 mm in the north of the basin to 1800 mm in the coastal zone (Shaibu, 2011).

The Volta Basin has a low relief with altitudes varying between 1m and 920m. The average mean altitude of the basin is approximately 257m, with more than half the basin in the range of 200-300m. The geology of the main Volta is dominated by the Voltaian system. Other geological formations include the Buem formation, Togo series, Dahomegan formation, and Tertiary-to -Recent formations (GEF-UNEP, 2002). The soils of the Basin are derived from rocks of the mid Palaeozoic age or older, comprising mainly Siluro-Devonian sandstone and shales and some igneous and granitic material (Andah and Gichuki, 2005: GEF-UNEP, 2002).

### *3.1.2 Socio-Economic Features*

**Table 3.1 Population Distribution (Volta Basin Countries)**

<b>Country</b>	<b>Population</b>	<b>%</b>
Benin	476 775	2.6
Burkina Faso	8 874 148	47.6
Cote D'Ivoire	397 853	2.1
Ghana	6 674 376	35.8
Mali	625 000	3.3
Togo	1 594 446	8.6
<b>Total</b>	<b>18 642 598</b>	<b>100</b>

**Adapted from Volta HYCOS (2006)**

Population in the Basin is expected to grow to over 33 million people in 2025 with Basin growth rate of 2.54 %. Life expectancy rate in the basin is fairly low, varying between

47 years and 56 years with an average of 52 years (GEF, 2002). Population settlement in the Basin countries is largely rural, ranging between 56% and 83%. Population density varies considerably, being highest in Ghana (87/km<sup>2</sup>), and Togo (86/km<sup>2</sup>), and lowest in Mali (9/km<sup>2</sup>) (Andah and Gichuki).

Agriculture is the most important economic factor, followed by the tertiary sector and mining (particularly in Ghana) (AWF, 2010). The agricultural sector accounts for over 86 % and 92 % of the total employment in Mali and Burkina Faso respectively with the remaining riparian countries accounting for not less than 60%. The agriculture sector accounts for a higher proportion of female employment than male employment (Andah and Gichuki, 2005).

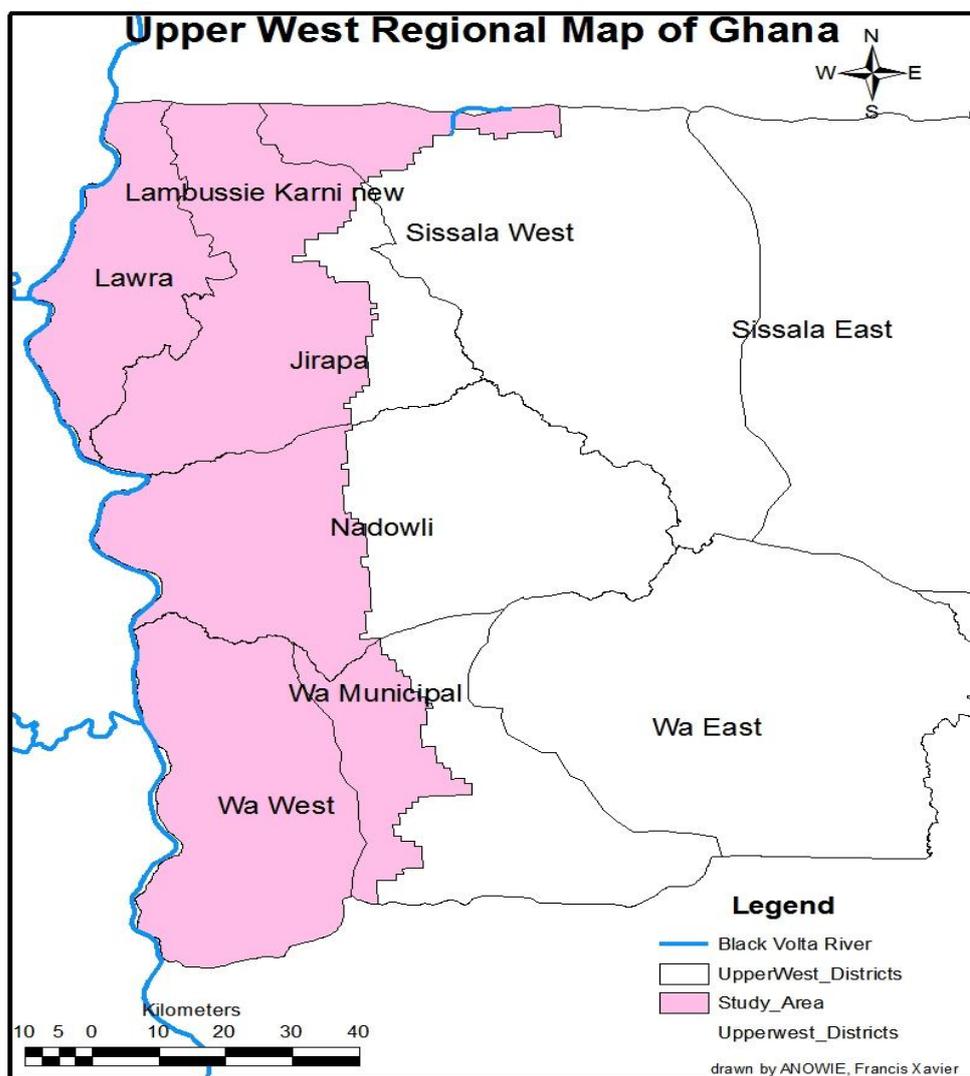
### 3.2 Study Area



**Figure 3.2: Volta Basin Showing the Study Area**

### 3.2.1 Physical Characteristics and Population

The study was carried out in the Upper West Region of Ghana, located in the north-western corner of Ghana in the Black Volta Sub-Basin. In Ghana the Black Volta basin lies in the Upper West Region, Northern Region and the Brong-Ahafo Region. Upper West Region is bounded to the north by Burkina Faso and to the west by the Black Volta River which forms a border between Ghana and Burkina Faso. To the east it share borders with the Upper East Region and to the south with Northern region. The region lies between longitudes 1°25'W and 2°50'W, and between latitudes 9°35'N and 11°N.



**Figure 3.3: The Study Area**

The Upper West Region has an estimated land area of 18,476km<sup>2</sup> and population of 702,110 based on the 2010 Population and Housing Census (Final Result), indicating a population density of 38persons/km<sup>2</sup>. The region has nine administrative districts: Wa West, Wa

Municipal, Wa East, Sissala East, Sissala West, Nadowli, Jirapa, Lambussie Karni, and Lawra (GSS, 2012). The study was undertaken in the Wa West, Lawra and Nadowli portions in the Black Volta Basin. The three major ethnic groups are the Dagaabas, Wala and Sissala. The predominant religions are Christianity, Islam and Traditional religion. Traditional life and beliefs, like elsewhere in the country, are more prominent in the rural areas.

### ***3.2.2 Topography and Drainage***

The region has an almost entirely low lying undulating topography, especially in Wa west and around Lawra, better referred to as the Wa-Lawra plains. The region is characterized by a series of wide plateaus made up of Birrimian and post-Birrimian granites and their weathered materials. The three districts have average altitude between 180m and 300m above sea level. The Black Volta is the main river that drains Lawra, Nadwoli and the Wa West districts. Most of the tributaries to the Black Volta are seasonal.

### ***3.2.3 Geology and Soils***

The rock formation in the Lawra and Nadowli districts is essentially Birimian with dotted outcrops of granite and some parts of the east Nadowli is basement complex. The Wa West district is underlain predominantly by Precambrian, Granite and Metamorphic rocks that have seen less weathering due to low rainfall, high evapo-transpiration and less vegetation. The soils in the Lawra district consist mostly of laterite soils developed from the Birimian and Granite rocks which underlie the area. There are also strips of alluvial soils along the flood plains of the Black Volta as well as sandy loams along some of its tributaries.

The soil types that dominate in the Nadowli district are laterite, sandy and sandy loam (savanna ochrosols). They are generally poor in organic matter and nutrients as a result of the absence of serious vegetative cover due to bush burning, overgrazing, over cultivation and

protracted erosion and are heavily leached. Wa West district has two main soil types; the ground water lateritic soil and the Savanna orchrosols found along the Black Volta. These soil types occupy a toposquence, and vary from shallow and gravelly soils on undulating terrains to deep, grayish brown alluvial clay bottomlands.

### ***3.2.4 Climate***

The climate of the Upper West Region is characterized by a short, single-peak rainfall regime and a long dry season from October to the end of April. The southern part of the region can be classified as a tropical rainy climate with a distinct dry season, whereas the northern part can be described as a dry climate with annual evaporation exceeding annual precipitation. The rainfall pattern is a result of the region's location in the sub-equatorial zone with changing wind regimes in the course of the year. During the dry season, the area is under the influence of the dry North-Eastern trade wind (Harmattan); as a result, relative humidity drops to a minimum of 16% in January (Wa).

During the rainy season the maritime air from the South West monsoon and strong convection cause high rainfall and relative humidity levels, reaching 69% in August (Wa). The Nadowli district lies within the tropical continental zone and annual rainfall is confined to 6 months starting from May to September and unevenly distributed. Mean annual rainfall is about 110mm with its peak around August. From October to March there is little or no rain and this long dry season is made harsh by the dry northeastern Harmattan winds. The Wa West District has a mean annual rainfall figures varying between 840mm and 1400mm. The mean monthly temperature for the Upper West Region ranges between 21°C and 32°C. Temperatures rise to their maximum (40°C) in March, just before the onset of the rainy season. Temperatures fall to their minimum (20°C) in December during the harmattan (North East Trade winds).

## CHAPTER 4

### RESEARCH METHODOLOGY

#### 4.1 Research Data

The research was a purely qualitative study; however both qualitative and quantitative data were collected for analysis to arrive at the research findings and conclusions. The qualitative data were lived experiences by the community members, their beliefs and cultural aspects of water use and regulation. Such information was mainly got through review of literature, field observation and meetings and interviews with communities. Quantifiable and measurable data meant to give an idea of the number of people in the community in favour of a system was also taken from respondent through the use of questionnaire survey for statistical analysis. These were compared and contrasted with the qualitative data collected.

Purposive sampling was employed for data collection, with persons and institutions relevant to the research selected for interviews and questionnaire administration. Interpreters were employed and trained to assist with data collection in the communities. Data collected was on water sources and uses, water management arrangement in place, cooperation with other users, challenges communities were faced with respect to water management and development, and communities' expectation of water resources management.

#### 4.2 Scope of Study

Three (3) Districts from the Upper West Region of Ghana were the focus area in the Black Volta Basin. Seven (7) coastal rural communities were selected from these 3 districts; Wachiau (Talawona) from the Wa West District, Baase and Zupiri from the Nadowli District and Bagri Zongo, Char-Baatani and Metaw-yepala from the Lawra District. Major criteria used for selecting these communities were;

Rural communities

Primary communities (first users) lying along the Black Volta River

Communities that depend to Black Volta for livelihood

Ease of access to community by Researcher

### **4.3 Data Collection Methods**

#### **4.3.1 Primary Data**

The following were the main methods adopted for collection of primary data:

##### **4.3.1.1 Observation Tour**

Observation tours were carried out with selected key informants from the communities. Number of key informants selected ranged from 2-5 per community usually from youth groups to engage in a situational inspection on relevant water development sites for direct facts findings (see Plates 4.1&4.2). This was the first activity that was carried out in each community, after the observance of all necessary protocols, including the introduction of the research to the communities through the chiefs and elders for permission. Some of the activities included a canoe ride on the Black Volta River especially along the communities' section of the river, transient walk to some of their water sources and general tour around the community. Information ensuing from the casual interaction between the research officer and the key informants were noted. Pictures of interesting places were also taken.



**Plate 4.1 Tour at Ongbile dam site (Metoyipala) with selected members of the youths**



**Plate 4.2 River tour at Talawona (Wachiau) to inspect activities at the river banks**

#### ***4.3.1.2 Interviews***

Water users, water management institutions and environmental regulatory institutions were interviewed through either telephone conversations or direct interviews. Personnel for interviews included community leaders (chiefs and water committee heads), and from organizations including: Environmental Protection Agency (EPA), District Assembly (DA), Ministry of Food and Agriculture (MOFA) - Crops and Fisheries Directorate, GIDA. Interviews mainly bothered on the mandate of their organizations, their challenges and expectations with regard to water development and management of the Black Volta River and other water sources at the community level. Other aspects focused on local participation in water development and management.

#### ***4.3.1.3 Questionnaire Survey***

Structured questionnaire made up of both closed and open ended questions were administered in all the seven (7) communities. The open ended questions allowed for further probing of respondent. Respondents (20 in number from each community) were selected to include people from water committee, youth group, women group, opinion leaders, fishermen group, gardeners groups (crop irrigators at the river banks) and ordinary community members. Each encounter lasted for less than half an hour (See appendix for sample questionnaire).

#### ***4.3.1.4 Focused Group Meetings***

Meetings were organized separately for women and men in each community to discuss water management issues. This was organized for separate days after interviews and questionnaire surveys were carried out. These meetings usually were to discuss the roles and expected contributions of community members to in water management. The discussions also focused on local participation and cooperation of water development and management of their various

sources with respect to external agencies including NGO's, government institutions, etc., involved with water and environment issues.



**Plate 4.3 Interview with the Chief  
(Bagri Zongo community)**

**Plate 4.4 Focus group meeting with women at  
Baase community**

#### ***4.3.2 Secondary Data***

These were mainly collected through reviews of relevant literature to the topic and study area. It included research publications, policies and frameworks for management of water and environment in the Volta basin.

#### **4.4 Data Analysis**

Quantitative data collected was analysed using excel and SPSS software tools.

## CHAPTER 5

### RESULTS AND DISCUSSIONS

#### 5.1 Water Development and Management Practices in Rural Communities

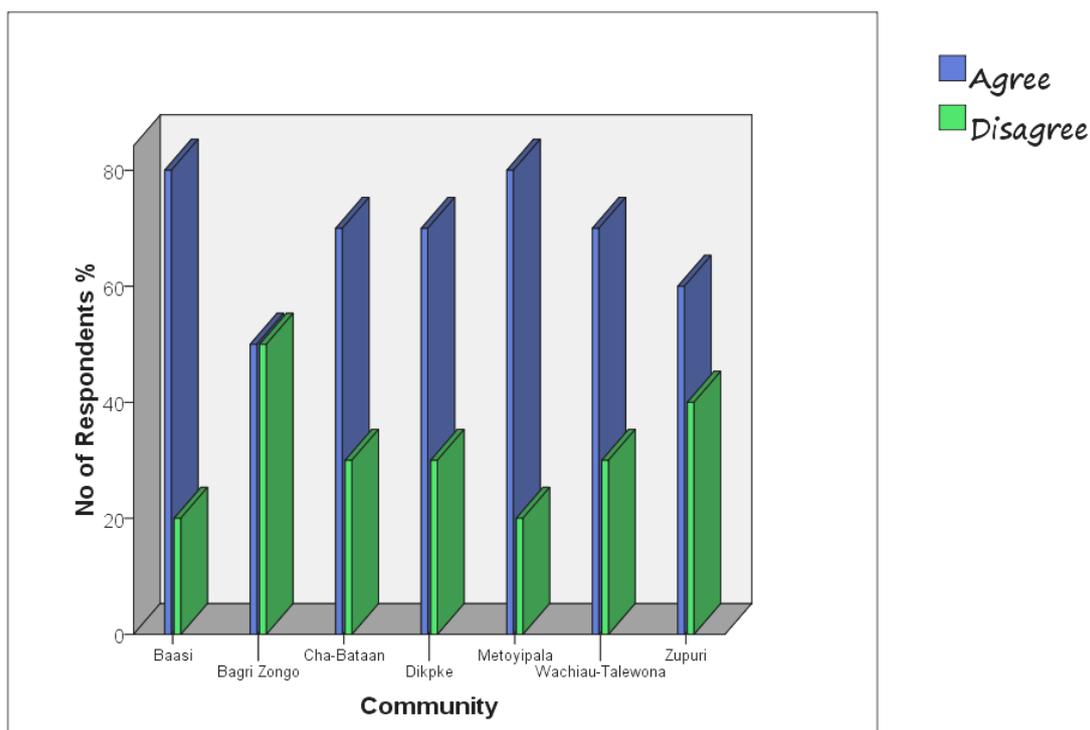
##### 5.1.1 Water Management Regime in the Rural Communities

The Water Resources Commission (WRC) was established by an Act of Parliament (Act 522 of 1996) with the mandate to regulate and manage Ghana's Water Resources and coordinate government policies in relation to them. The Act stipulates that ownership and control of all water resources are vested in the President on behalf of the people, and clearly defines the WRC as the overall body responsible for water resources management in Ghana. The first WRC regulations developed and adopted by Parliament is Legislative Instrument (L.I.) 1692 (2001). It sets out regulations for the issuance of water use permits or grant of water rights for various water uses including Domestic and Agricultural uses (WRC, 2011). These functions were not found to be fully exercised in the communities, due to the communities still regarding the traditional authority as having absolute control to water rights and the inability of the WRC to be decentralised in the Black Volta Basin like elsewhere in the White Volta Basin to effectively carry out their mandates. Thus people pumping out water from the Black Volta River to irrigate their farms were not to be regulated by the WRC in the communities.

All seven communities visited adapt more to the use of their customary practices in water management. This supports the views by many including Opoku-Ankomah et al. (2005) that changes of customary practices in water management due to the influence of the colonialism and modernity is slower in the rural areas than the urban areas. The governing bodies for the communities visited are Chiefs and Elders, who are respected for their decisions and directions. All the communities have a *Tindaana*, who is a custodian of all the lands and the gods in the community. The community chief thus governs the community and all its resources including water in collaboration with the *Tindaana*. The Chiefs are revered, with their

pronouncements on issues sometimes as authority. Thus the communities usually accept and adopt reforms in water management from external sources including national government and NGO's when their Chiefs and Elders agree to that, as was claimed by the people of Dikpeh community.

The study communities still use and advocate for the application of traditional methods like taboos and other local institutions for water management. All the communities apart from Bagri-Zongo had more than 70% of respondents (See Fig 5.1) agreed that the use of traditional customs in water management was still relevant. The Black Volta River (locally known as “*Manne*”) is still believed to be a god to all the communities. People in the study communities believe that the river protect them from all possible calamities that might befall them, including theft at the river banks which is a major issue.



**Figure 5.1: Relevance of Traditional Customs in Modern Times for Water Management**

The people of Wachiau community regard the hippopotamus found in the Black Volta River as their gods. This they traced from a belief that the hippopotamus once helped them (lining up across the river as a bridge) escape to the other side of the river but denying the enemy the

same access during a war between another community. The community therefore does not allow the hippopotamus to be hunted.

### ***5.1.2 Challenges with Water Development in the Basin***

Preliminary Transboundary Diagnostic Analysis (TDA) carried out in the Volta Basin identified the following: Land degradation, Water scarcity, Loss of biodiversity, Flooding, Water-borne diseases, Growth of aquatic weeds, Coastal erosion, Water quality degradation as among the major perceived problems and issues in the basin (GEF-UNEP, 2002). All the communities visited apart from Wachiau had community members engaging in dry season crop farming (garden) at the banks of the Black Volta River (See Plate 5.1). This practice was also found with the riparian communities in Burkina Faso as was observed at the river banks of Burkina Faso communities. Crops usually cultivated at the banks included pepper, tomatoes, and sometimes for transplants of tobacco as was the case in Baase community.



**Plate 5.1: River bank garden at Metoyipala**



**Plate 5.2: Flood plain erosion at Bagri-Zongo**

The activities of these farmers had a negative toll on water management, as economic trees were sometimes cut down at the banks only to cultivate the land leading to increased silt loads into the river. In a focus group meeting at Zupuri community, the people assigned land fertility as one of the reasons that makes them cut trees at the banks for crop cultivation, even though they agreed that the practice introduces silt and agrochemicals into the river. To maintain the moisture content of their crops at the banks due to the sloppy nature of the land

and to maximize the use of the fertilizer, they usually make sunken beds (see Plate 5.1) where the seeds are planted, which the communities claimed that it reduces chemicals into the river.

Indiscriminate burning of bushes is very rampant in all the communities visited (see Plate 5.3). The reasons the communities gave for these negative practice included among others; for the preparation of farm land before cropping season and livestock feeds, for hunting exotic animals, honey harvesting, and last but not least as a show off (children burn bushes to challenge peers as to who can burn a greater area). These reasons were confirmed by Mr Emmanuel Lignule (Programs Officer, EPA) in an interview.

The use of unapproved methods and tools for fishing and some mining activities in the Black Volta Basin was also an issue. This included the use of dangerous chemicals like Dichloro-diphenyl -trichloroethane (DDT) for fishing resulting in fish kills and undersized net usually with openings below 1 inch that traps young fishes. One other means was the use of fishing nets across the width of the river and the use of bamboos (see Plate 5.4) to trap fishes (including fingerlings and pregnant ones) thus denying downstream users of fish stock. These practices were learnt to be engaged in by people from communities in both Ghana and Burkina Faso sides.



**Plate 5.3: Bush burning at Talewona**



**Plate 5.4: A typical fish trap at Talawona**

### 5.1.3 Water Transport Services

In all the communities visited, people provide water transportation services. People and goods are transported across the Black Volta River, to the riparian communities in Ghana and Burkina Faso by the use of mainly a canoe. It is indeed a very lucrative venture and it also boosts trade between the two countries. Goods including livestock, rice, motor bikes etc. are transported between the two countries. Transporting motor bike across the river cost about \$2(4 Ghana cedis), whilst 50 cents (one Ghana cedi) is the fee per person. In Wachiau traditional area, water transport services is run as tourism for holiday makers who visit the community for boat rides and hippopotamus sightseeing on the Black Volta River.

Some of the issues accompanied with this transport business include cases of theft of goods at the banks especially of livestock, which is a major conflict issue among riparian communities. Offenders of theft are usually cursed with the Black Volta River. Other issues include the use of dilapidated canoes (see Plate 5.5) for such services, lack of safety gears (lifejackets) for clients, and the child labour. Children under age of are sometimes used as the *canoe porters* transporting people (including children) and goods to either side of the River.



**Plate 5.5: Dilapidated canoe used for water transport (Zupuri community)**



**Plate 5.6: A child canoe porter transporting children and goods (Char-Batan) community)**

When interviewed the canoe porter named Kwabena (See Plate 5.6) believed to be less than 14 years old and from Birifo, a community close to Char-Batan, claimed that he does the work as transport porter so as to earn money for his family. He does not attend school and operate at each day between the hours of 6 am to 6 pm.

#### **5.1.4 Local Groups Used For Water Resource Management in the Communities**

Communities visited have constituted from among themselves Water Committees to manage their sources of water. The water committee is usually for managing boreholes, spring water and small earth-dams found in the communities. See Table 5.1 for water sources in the communities visited.

**Table 5.1: Sources of Water in the Communities**

<b>Water Source/ Community</b>	<b>Borehole</b>	<b>Spring</b>	<b>Earth Dam</b>	<b>Pond</b>
Metoyipala	yes	nil	yes	nil
Dikpeh	yes	nil	nil	nil
Bagri Zongo	yes	nil	nil	nil
Zupuri	yes	nil	nil	nil
Baasi	yes	nil	nil	yes
Cha-Bataan	yes	yes	nil	nil
Wachaeu/ Talewona	yes	nil	nil	yes

The committee is also in charge of managing monetary contributions from community members and from any external sources meant for the management of their water sources. Members are selected unto the committee by community members themselves and subjected to approval by chiefs and elders. Membership is opened to both men and women based on their expected roles and contributions to the group. In all the communities visited, number of women in the committee was less than 50% of the total number. None of the communities visited had a woman as the leader of the committee. This they attributed to cultural settings during separate focus group meetings with men and women.

The men in Baasi cited that women were weaker and subordinate to them and were not supposed to lead men in any way. This accession by the men was challenged during focus group meetings with women in all communities except in Bagri-Zongo, a Muslim community, where the women agreed with the men's claim. Women membership in the committee, in all communities, was just for maintaining cleanliness at the water source as was learnt from the focus group meetings. In Bagri-Zongo, when community members were asked during a separate debate for men and women, whether the water committee is better off with either only men, or with only women constituting the group, they all answered in the negative. The reason they gave was that men and women were needed to play different roles. Women were expected on the committee to keep the water sources clean while men were to undertake repair works and other physical task that demanded the use of strength.

In Zupuri community, the water committee takes record of all visitors that come to engage the community on water development and management issues in their visitors' book. There were other groups which were used to manage water and related resources. In Metoyipala and Zupuri communities, the youth have formed a fire volunteering committee that check against bush burning and felling of trees at the banks and flood plains of the Black Volta River. Cutting of tree is limited to only dry and dead trees/wood.

### ***5.1.5 Challenges of Water Management and Development Institutions***

Environmental Protection Agency (EPA), Ghana Irrigation Development Authority GIDA and Fisheries Commission even though have their offices in the regions, they are not decentralised at the districts level to carry out their roles in the rural areas effectively. Even though there were occasion of fish kills in the Black Volta River as was disclosed by the communities the fisheries commission was not aware. This was due to the fact that there was

lack of engagement between the Fisheries Commission in the Upper West region and communities by the river.

EPA was engaged with some of the communities in afforestation programmes even though they were also not decentralised in the districts. They were however not involved with the monitoring of the afforestation programmes after implementation. An interview with Mr Emmanuel Lignule, the EPA Regional Programs Officer, disclosed that project implementation was not the core function of EPA especially where it was a privately initiated programme, but that EPA only comes in to support because of desertification in the catchment. They however collaborate with the traditional council, information services, forestry services division and other organisations like the global environmental facility (GEF) to manage natural resources.

GIDA is in charge of developing all irrigation schemes in Ghana. The Upper West Regional Engineer of GIDA complained about the inadequate staff, funds and logistic to carry out effective monitoring of the many irrigation schemes in the Black Volta Basin. They usually rely on the Ministry of Food and Agriculture (MoFA) Extension Officers to help with the management of the irrigation schemes after construction. However, due to lack of clear understanding between MoFA and GIDA, such task is usually not carried out by the extension officers. GIDA therefore after construction works of irrigation facilities, leave it in the hands of the beneficial communities to manage them.

GIDA also has issues with land dispute with some of the schemes. A typical case cited by the Regional Engineer is with the Tizza community's irrigation scheme where the irrigable area is found within another community. GIDA however suggest that, the way forward is for them to purchase the land from communities, construct the facilities and give out to interested people

to manage them. One other concern with GIDA is that its workforce is full of technocrats (engineers), thus they are not able to deal with social issues adequately

Due to these challenges of national water and related institutions to enforce regulations right at the community level, rural communities take advantage of their existing social settings and local governance system to manage water and related resources their way to fill the gap.

## 5.2 Community Based-Actions for Water and Related Resource Management

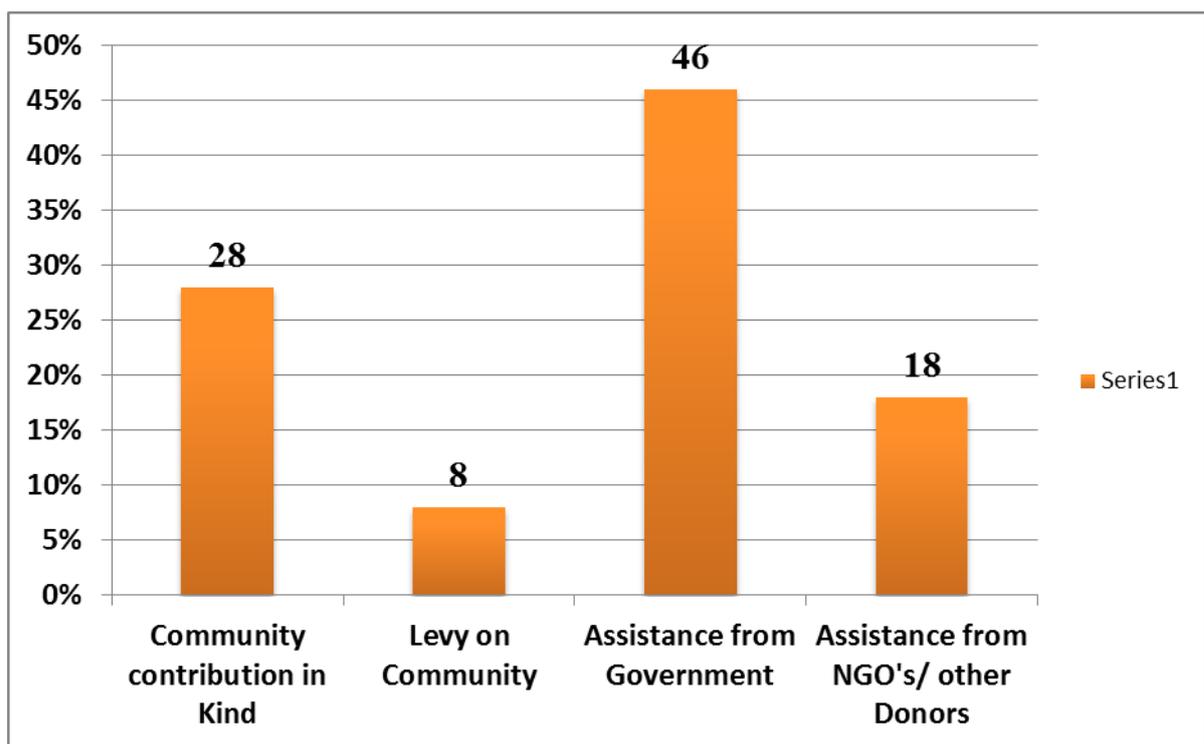
The study found out instances where the study communities, had applied more or less the ‘Community Participation Framework’ (See Table 2.2), i.e. from ‘Passive Participation’ through ‘Participation for Material Incentives’ to ‘Self Mobilization’ to undertake water development and management programmes. Typical examples of projects and programmes included boreholes; construction of an earth-dam (dugout) in Metoyipala community and afforestation programmes in Metoyipala, Zupuri and Wachiau communities to protect the river banks and the flood plains.

**Table 5.2: Some community-based actions in the Black Volta Basin**

<b>Community</b>	<b>Enforces Bye-Laws for Water Resource Management</b>	<b>Presence of Local Group for Resource Management</b>	<b>Aforestation Program on the banks or the flood plains</b>	<b>Ever had Water Quality and Quantity Discussions with other Riparian Communities</b>
<b>Baasi</b>	nil	Yes (not active)	nil	nil
<b>Metoyipala</b>	yes	Yes (active)	yes	nil
<b>Cha- Batan</b>	nil	Yes (not active)	nil	nil
<b>Bagri- Zongo</b>	nil	Yes (not active)	nil	nil
<b>Zupuri</b>	yes	Yes (active)	yes	yes
<b>Dikpeh</b>	nil	Yes (not active)	nil	yes
<b>Wachiau</b>	yes	Yes (active)	yes	yes

The communities participated to develop water projects sometimes from design stage where they provided information and other assistance during feasibility studies. In topographic surveys they provide labour and local materials (e.g. pegs) to survey team.

When respondents in all the study communalities were asked about how they would want water projects financed and executed, majority (46%, see Fig 5.2) said that it was the government's sole responsibility. About 28% advocated for the provision of labour and local materials by communities as contributions. Only 8% said that communities should be levied whilst 28% want NGO's and other donor agencies to support such project with their funding. This could be attributed to the visibility of many NGO's and the roles they play in most of these rural areas with respect to water development and other developmental activities.



**Figure 5.2: Communities' preference for finance of water development projects**

### **5.2.1 Joint Water Development- Metoyipala Case**

Metoyipala community has undertaken a joint water development project i.e. the construction of an earth dam (Ongbile dam, see Plate 5.5) with the District Assembly, to aid them with

their dry season crop farming and for livestock watering. Their contribution to the project was by providing labour and some local construction materials. After the construction of the embankment by the contractor, the community decided to undertake the stone patching and grassing of the faces of the dam. This they carried out by apportioning equal plot (see Plate 5.6) to all households in the community. The number of people in the various household ranged from 2-10 people. Each household, irrespective of the number, received an equal amount of incentive after the work which included maize, fertilizer, beans, oil and salt.



**Plate 5.7: Ongbile earth dam (dugout)**



**Plate 5.8: Typical plot for household as shown by the newly placed stones in this**

The community also used self-mobilization (see table 2.2) to extend the length of the dam after construction was over. They have also set out their own criteria to allocate water to community members for dry season farming and their livestock watering because they own the facility. Household who did not help in the construction are however excluded from use, including their livestock. The community is currently trying to procure water pumping machine which could be used to irrigate the field of members.

### ***5.2.2 Aforestation Programmes***

Three (3) communities; Metoyipala , Zupuri and Wachiau out of the total seven (7) study communities had had initiatives to plant trees in the flood plains and the banks of the Black Volta River. These have mainly been a collaborative action between the EPA, Global Water Initiative (GWI) and the communities. For the case of Zupuri community, EPA assisted the

community to write a proposal to the Global Environment Facility's (GEF) Small Grant Programme (SGP) to be assisted to undertake afforestation in the community when they expressed interest. This, the EPA said was an idea of one herbalist in the Zupuri community who was interested in protecting medicinal trees in the community.



**Plate 5.9: Aforestation programme in Zupuri**



**Plate 5.10: Trees that are not doing well**

These projects implementation upon interviews show that it has been successful, however there had not been effective monitoring of it after implementation. It has mainly been left in the hands of the communities sometimes without the supporting agencies taking part. In an interview with the EPA, they accepted the difficulty and attributed it to their inadequate human and financial resources, and that their core mandate does not include actual implementation of afforestation programme even though they come in to support such collaborative programmes.

One other challenge facing the smooth implementation of the programme is with the choice of tree species. Communities usually prefer economic trees that could earn them income; however EPA looks at the suitability of such species to thrive in a local area, and whether the tree species are invasive or non-invasive. EPA prefers non- invasive trees which can grow big enough to cover a larger surface area, are tolerant, and have multiple uses, e.g. grafted mangoes; *moringer* and *mahogany* plants rather than *teak* plants which are very invasive.

Respondents from the communities, without the afforestation programme, overwhelmingly expressed interest to also engage in the programme. The Chief of Char-Batan community in an interview said that he is making determination to seek assistance to plant cashew trees on the flood plain after he had received advice from his brother who lives in Accra.

### ***5.2.3 Bye-Laws for Water and Related Resources Management***

Some of the communities have instituted adopted by-laws from the district assemblies for the control of their natural resources. These are simple regulations which are usually accepted by all community members for managing the Black Volta River and related resources like land and animals. This includes laws that bar community members from undertaking measures like bush burning, felling of economic trees, crop farming at the river banks and using chemicals and unapproved net to fish in the Black Volta River. In Baasi community, market days are also used to discuss water issues during which bye-laws are made for water source protection. In Zupuri community, there was collaboration with the EPA to plant trees and protect already existing trees from being cut down. Metoyipala community has fire volunteering committee that monitors and enforces the strict adherence to bye-laws, whilst in the case of Wachiau community there was the ‘Rangers’ a policing community based task force, that enforces the community’s bye-laws.

Goziiri community in Upper West region which is not part of the study communities, according to the EPA is a model community which has succeeded in institutionalizing bye-laws that prohibit burning of bushes and felling of trees by the locals. This has sustained since 1987 and is being commend and recommend to other communities for emulation by the EPA.

### ***5.2.4 Joint Water and Related Resources Management-Wachiau Case***

A typical case is what exists in Wachiau community where they apply self-mobilization to manage water and related resources. Seventeen (17) rural communities have come together

under the leadership of the Paramount Chief of Wachiau to form the ‘*Wachiau Hippo Sanctuary Board.*’ The core function of the sanctuary Board is to develop and manage the Black Volta River and related resources as a tourist attraction site. It is purely community-based management initiative.

All the member communities come together as the ‘*Development Zone.*’ There is a ‘*Core Zone*’, a protected area, which is banned from all human activities that is agreed upon by all sub chiefs from the 17 communities. Tourist attraction includes canoe ride and hippopotamus sightseeing in the Black Volta River at Talewona, which is one of the communities. Activities banned in the Core Zone includes; cutting of trees, bush burning, hunting of animals, farming at the river side, harvesting of oysters and fishing. The community have set up a policing taskforce called ‘*Rangers*’, with membership from all the 17 communities, that enforces these measures. Any employee from the 17 communities is bound to report negative practices.



**Plate 5.11: Interview with a tour guide (Hippo Sanctuary Board, Wachiau)**



**Plate 5.12: Paramount Chief of Wachiau (middle)**

Proceeds accrued from the management of the Hippo Sanctuary are used to develop all the communities (Development Zone), through provision of boreholes, employments and scholarship packages for the youths. The sub-chiefs and people of any of the communities are liable for non-adherence to the accepted rules and bye-laws by the Sanctuary Board and the Paramount Chief. Appropriate sanctions, including a member community being denied of their share of development from the generated funds, are meted out to such community. There

was however no coordination between the Sanctuary Board and riparian communities in Burkina Faso as gathered during interview, even though there was the Forestry Agency in Burkina Faso which was found to be actively protecting the trees in the flood plains from being cut down. The Wachiau Hippo Sanctuary receives some form of financial and other assistance from Canada as was confirmed by the paramount chief of Wachiau.

### 5.3 Cooperation and Collaborations for Water Resource Development and Management in Black Volta Basin

#### 5.3.1 Cooperation and Collaborations among Local Communities

Water resource management in International Basin thrives well in a regime of cooperation by the riparian states. International Customary Water Law obligates riparian states of International Basin to cooperate in the Protection and Sustainable use of water resources (UN IWC, 1997). This can be extended to riparian communities in International basin. The riparian communities from Ghana and Burkina Faso live peacefully on either side Black Volta River (see Fig 5.3).

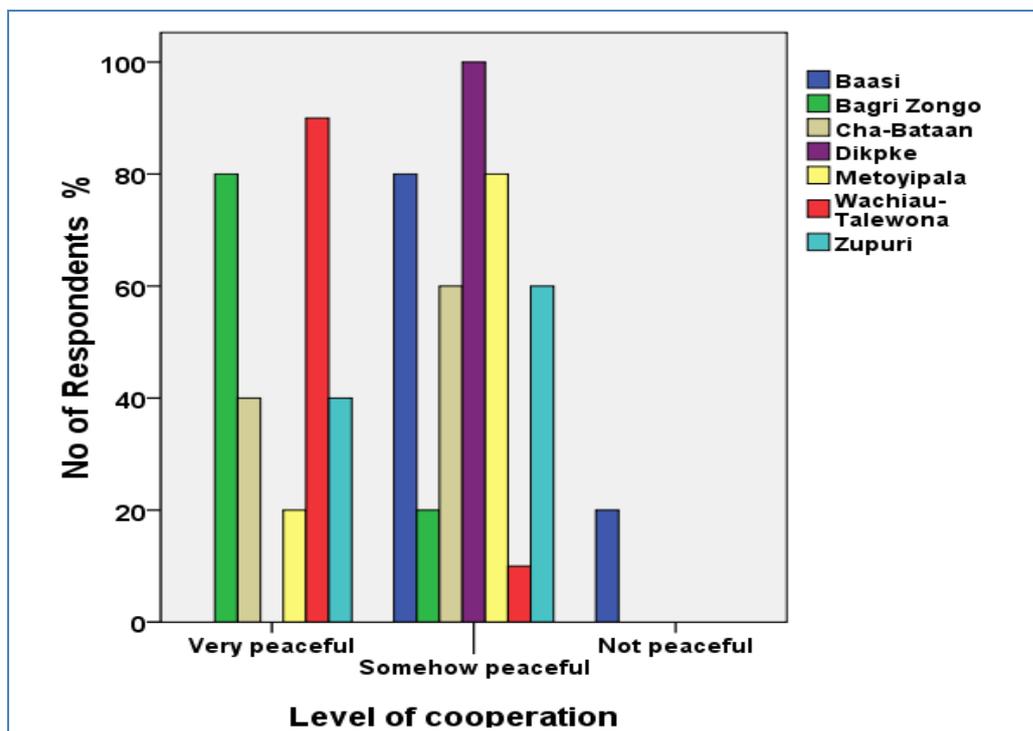


Figure 5.3 Cooperation between Ghana and Burkina Faso communities on the use of the Black Volta River

Riparian communities in Ghana and Burkina Faso inter-marry; attend social functions like funerals and wedding ceremonies across either side, with some community members residing in both Ghana and Burkina Faso. There is flow of information between them on water use even though each community belongs to a sovereign country. In Baasi community however, 20% of the respondent said that cooperation between them and the community in Burkina Faso was not peaceful. This was attributed to the fact that the Chief of Baase's son was mistakenly suspected to be a thief and murdered when he visited the community in Burkina Faso, as was claimed by the Chief of Baase, thus some tension between the two communities.

The Communities visited share their water sources especially, boreholes; spring water source; small earth dams (dugouts); where applicable, with other water stressed upland neighbouring communities in Ghana. However upland users (communities) require permission from land owners (*Tindannas*) for plots of land from communities by the river, for river bank crop farming. There is exchange of information on water use between riparian communities in Ghana and Burkina Faso. In an interview with the Chief of Zupuri community, he claimed that there was a case where his counterpart Chief, from the Burkina Faso cautioned them not to drink from the Black Volta River because of pollution concerns, i.e. mining activity in Burkina Faso part.

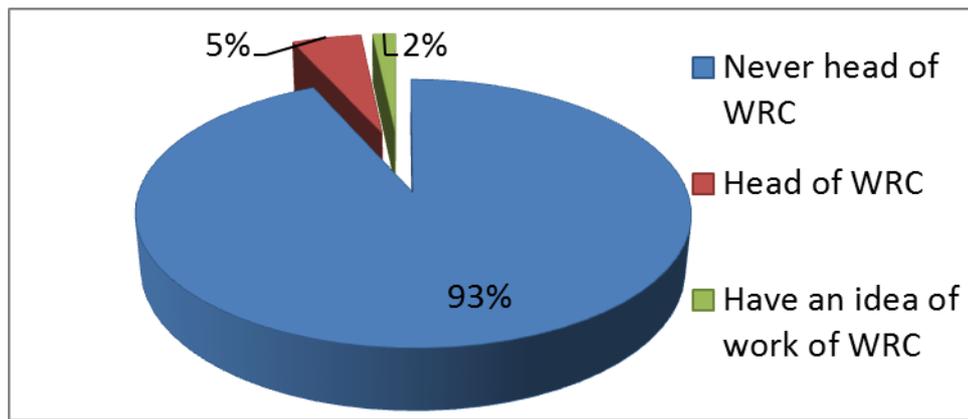
All the communities visited, however claimed that it was difficult to get their riparian communities from Burkina Faso to adopt their measures of protecting the river. Thus if the communities in Ghana decided not to farm at the river side, cut trees in their end of the flood plain, or not use unapproved means to fish, they could not guarantee the same measures being taken on the Burkina Faso side or even their upstream or downstream Ghanaian communities.

Communities are concerned over how other riparian communities (upstream and users across the river) use the river. Over 90 % of all the respondents spoken to in the study, on whether communities must be concerned over the use of the river by other riparian users, said yes. They were however not sure how best upstream-downstream riparian communities and riparian communities across the Black Volta River could foster a program to manage the river and related resources in a sustainable manner, even though it was learnt that the Global Water Initiative (an NGO), had once organized a meeting for some riparian communities to address water management in the Black Volta Basin.

### ***5.3.2 Cooperation and collaboration between Rural Communities and State Water***

#### ***Institutions***

Policies and management plans developed by formal Inter-States processes eventually rely on the implementation at local sites (Chen, 2008). Cooperation therefore between local communities and Institutions that promote development and sustainable use of water resources must be healthy. The communities visited did not have constant direct contact with most of the water development and management institutions. Apart from few NGO's and some cases EPA and the District Assemblies, community members could not mention the names of Water Management Institutions involved in the management of the Black Volta Basin. When pressed about their general knowledge of the WRC and its function in the management of the Black Volta Basin, only few people had heard of them. This confirms a similar finding by Kogo (2009) in the White Volta Sub-Basin that has a sub basin board constituted. It was unclear whether the White Volta Sub-Basin Board had an oversight responsibility on the Black Volta Basin.



**Figure 5.4 Community Members' Knowledge of the WRC and its Functions**

When communities were asked to mention some of the water resource regulations and bye-laws that affect their livelihood, most of the respondents raised the issue of bye-laws that refrains them from farming at the river bank. They requested for assistance like water pumps from government to harness the River, so that they could farm at a distance from the banks of the river in the dry season to reduce the rate of siltation. The communities also said in various focus group meetings that they prefer to have water management Institutions to be made up of both formal laws and also their customary practice (See Figure 5.5). The Chief of Dikpeh in an interview said that if their cultural believes for managing the river is seen as ineffective, then they should be educated adequately on new laws before it is implemented.

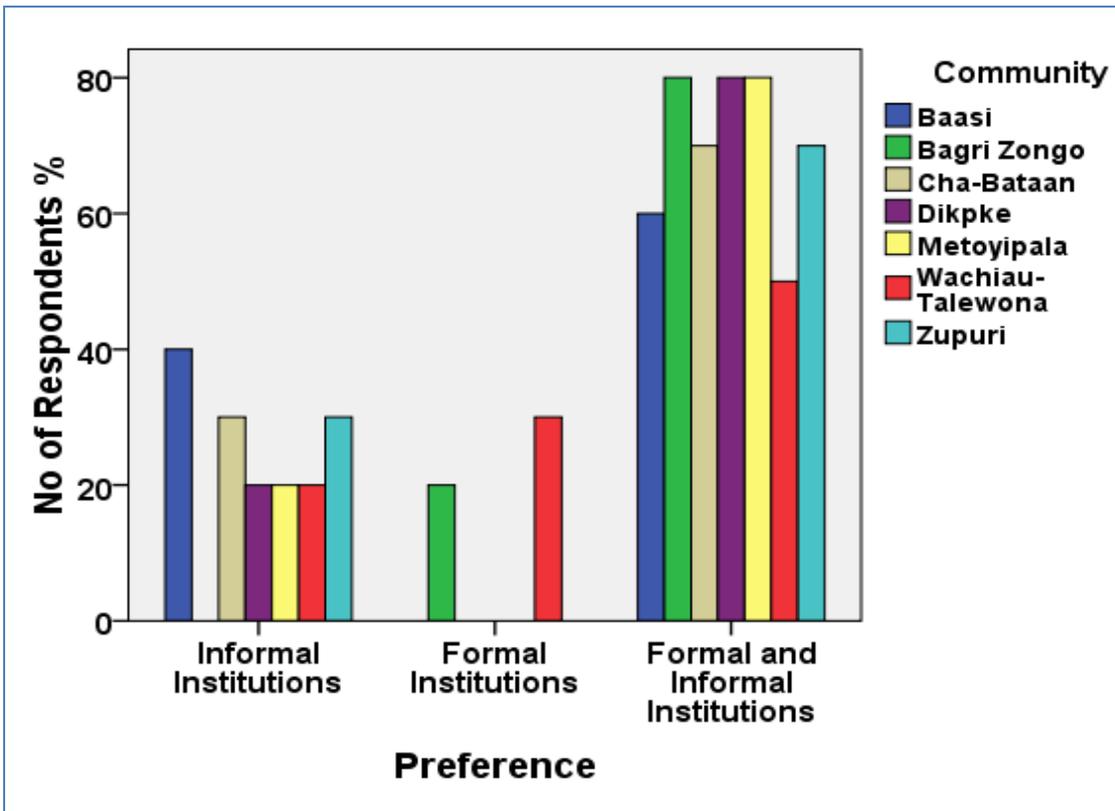
The communities do cooperate with Ghana Irrigation Development Authority (GIDA), District Assemblies (DA) and Community Water and Sanitation Authority (CWSA) to provide them with boreholes and dugouts (earth-dams). This they support sometimes from the design state to the case where they manage the scheme. In the design phase the communities usually assist with helping out with feasibility works and sometimes validating designs, where designs are agreed by them and consulting team in a meeting. During construction works communities usually provide free labour, accommodation to workers of the contractor and local construction materials. The regional Engineer from GIDA, Mr Eric Adu Danquah cites Babile community's gravity open channel dam scheme which has an irrigable area of 3

hectares as one of the successful stories of community based management of water schemes in the Black Volta Basin. He however cites Tizza community's irrigational scheme as one of the unsuccessful schemes due to the issue of land disputes.

The communities together with GIDA however have issues with pre-selected projects from the assembly. These are water projects like boreholes and dugouts that are to be constructed for the communities due to some influential people, usually to fulfil a political promise. Cases like this usually overlook proper feasibility and affect mobilization of community members before and during construction works, as was stated by GIDA. Where mobilisation of work force in the communities was a problem, GIDA paid the few community members that assisted with construction claimed by the Regional Engineer.

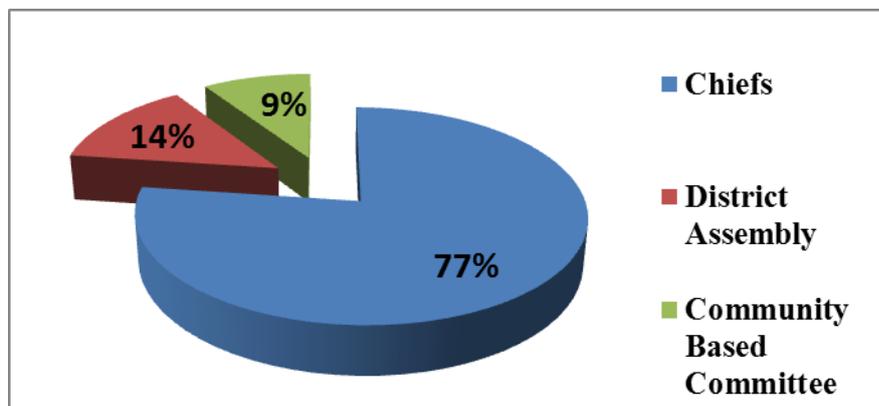
### ***5.3.3 Dispute and Conflict Resolutions***

All communities preferred and used their chiefs and elders to resolve all water conflict when respondents were asked about water conflict resolution system in place (see Figure 5.6). Minor issues are taken care of by the water committee as in the case of Metoyipala. Difficult cases are sent to the District Assembly through their Chiefs and other representatives. Most of the water disputes in the communities are to do with livestock drinking from unapproved sources or destroying farms at the river side and theft at the river banks. Where dispute has been transboundary in nature like theft of livestock from Ghana to the Burkina Faso community, two of the riparian chiefs in both countries have tried to settle them, otherwise they reports through the chiefs to the District Assembly.



**Figure 5.5** Communities' preference of institutions for water management

In Talawona (Wachiau) the people mentioned the killing of the Hippopotamus by upstream community members when the animals went there to feed. This was resolved between the two Chiefs, as claimed by one of the elders of the community, during focus group meeting. In a case where livestock destroys the farms at the banks, the mode of resolution depends on whether the animals are owned by a community member or from other communities. Owners from community members are warned first and fined in next offense whilst owners from other communities are fined in their first case. Fines are used to compensate the victims.



**Figure 5.6:** Preferred choice for water conflict resolution in the communities

#### **5.4 Impact of Communities' Livelihood on Water Resource Development and management**

The livelihood of communities has an impact on water resource development and management. The communities visited depend solely on the natural resources with agriculture as their major source of livelihood. They are either into small scale crop farming and fishing trading of farm produce, *pitoo* brewing, shear butter processing, and rearing of livestock. The Black Volta River is an important and a major resource to the rural coastal communities for survival. Spiritually and physically many rural folks rely on it as a means of protection and a source of prosperity. In Baase community, the women harvest oysters (locally known as *elme*) from the river, whilst women in Bagri-Zongo are mainly fishmongers because the community is a major fishing community in the Black Volta Sub-Basin.

Due to the long dry season and the poor nature of soil for crop farming, the communities practice shifting cultivation therefore burning large areas for cultivation and also there is crop farming at the river banks. The brewing of *pitoo* and charcoal production in the communities also leads to indiscriminate cutting down of trees and burning of bushes. These actions gravely lead to biodiversity loss, increases in the silt load in the Black Volta River.

In all the focus group meetings held, the communities attributed dwindling yields of boreholes and wells particularly during the dry season, periodic flooding of the plains of the Black Volta, to the indiscriminate cutting down of trees for firewood, burning of bushes and farming at the banks of the river that result in the river being silted up. They believe that such practices have affected rainfall pattern resulting in the reduction in both underground and surface water resources.

The Communities however agreed to partner any group or organization that seeks to facilitate conservation of biodiversity in a participatory sense with their concerns and views treated

with respect and appreciated. All the communities visited called for support and assistance from external agencies, including government and NGO's, to harness the river and the natural environment in a sustainable manner. This included provision of water pumps and other structures like dams in the community to supply them with water for dry season farming.

## CHAPTER SIX

### CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Conclusions

Communities visited usually accept and adopt reforms in water management from external sources including national government and NGO's when their Chiefs and Elders agree to them. They are aware of their actions that impact negatively on water resource. They are also aware of the favourable solutions to arrest the situation.. The study communities are however challenged to manage and develop the natural resources in a sustainable manner, due to their quest to exploit natural resources, which is the only means for survival. The communities require and call for programmes that are livelihood oriented for sustainable water resources management.

Communities visited, even though had issues with how other riparian communities use the Black Volta River, they do not think they have the necessary power and resources to take initiatives that bring other communities on board (the practice of IWRM) to stick to sustainable practices of developing and managing natural resources. They still believe natural resources to be a common pool resource and that they cannot control the use of it by other communities. This can be attributed to high illiteracy rate and poverty in the rural communities. Their main concern is to protect the immediate environment and only wish other communities could do same. The communities see the Black Volta River as an important and a major resource to them both spiritually and physically, and for their protection and as source of livelihood.

Water Management Institutions from government and NGO's are doing well to manage the water resources in the Black Volta Basin. It was however realized that the government agencies are constrained by human and financial resources, to effectively carry their roles and

functions in the rural communities. Some water developmental projects and programs from external sources especially from government are virtually imposed on local communities without enough consultations. Communities' participation of water projects and programmes were mainly effectively done at the implementation levels. Whenever there has been good cooperation between communities and any developmental partners, projects and programmes has been welcomed by communities and implemented successfully.

## **6.2 Recommendations**

Since formal Institutions may not have the resources to manage effectively natural resources especially at the rural and interior community levels, communities' efforts (community based actions) and their social settings should be acknowledged as a key and contributing factor to managing the resource in a sustainable manner. These actions could be encouraged and streamlined where necessary to fit into a suitable sustainable framework for water management in the basin. Chiefs and key influential people in the communities, who wield the respect of the community members, should be recruited into any project implementation plans meant for the community. Stakeholder participation should be encouraged in all parts of a project and programmes and not restricted in many cases to the project implementation stages but in the planning and design stages as well.

Community based actions for water resource management can be a good model if all stakeholders commit themselves to it as partners. In requesting communities to adopt best practices for water resource management, alternative means of livelihood should be extended to them. Communities should be supported with measures that improve their livelihoods, including provision of schools close to them to increase literacy rates, and modern simple technologies (e.g. water pumps) to harness the Black Volta River especially during their long dry seasons. They should be educated adequately before any policy or development plans are implemented at the community level.

The community based actions for natural resource managed at Wachiau especially and from other communities should be supported by Government and scaled out in other communities. Communities that engage in some actions (e.g. adopting and enforcing bye-laws) to protect the natural environment including water resources should be considered first for developmental projects from government and other donor agencies as it is done by the Lawra District Assembly.

Research results on community based actions for water and related resources management like this should be shared with the rural communities where these findings are found in a way they would understand.

## REFERENCES

- Africa Water Task Force (AWTF). (2002). Accra Declaration on Water and Sustainable Development in Africa: Proceedings of Regional Stakeholders' Conference for Priority Setting. Accra, 15-17 April [Available online] [www.africanwater.org/./accra\\_statement\\_15-17\\_april\\_2002.pdf](http://www.africanwater.org/./accra_statement_15-17_april_2002.pdf) (Accessed 25/5/2011)
- African Water Facility (AWF). (2010). A Case Study Report on the: AWF Support for the Creation of the Volta Basin Authority. [Available online] <http://www.africanwaterfacility.org/en/publications-reports/> (Accessed 10/3/2012)
- Agyenim, J.B. and Gupta, J. (2011) IWRM and developing countries: Implementation challenges in Ghana. Physics and Chemistry of the Earth, Parts A/B/C DOI 10.1016/j.pce.2011.06.007
- Ake, C. (1988). "Building on the Indigenous", in Fruhling, P. ed., Recovery in Africa: A Challenge for Development Cooperation in the 90s, Stockholm, pp. 19-22.
- Ampomah, B. Y., Adjei, B. A. and Youkhana, E. (2008). Transboundary Water Resource Management Regime of the Volta Basin. ZEF Working Paper Series, Bonn, Centre for Development Research,
- Andah, W., and Gichuki, F. ed. (2005). Volta River Basin Profile: Enhancing Agricultural Water Productivity through Strategic Research. International Water Management Institute, Sri Lanka. [Available online] [www.water-mwrwh.com/./CPWF%20Volta%20Basin%20Profile20](http://www.water-mwrwh.com/./CPWF%20Volta%20Basin%20Profile20) (Accessed (2/11/2011)
- Andreini, M., van de Giesen, N., van Edig, A., Fosu, M., and Andah, W. (2000) Volta Basin Water Balance. ZEF Discussion Paper no. 21, ZEF, Bonn, [Available online] [www.zef.de/fileadmin/webfiles/downloads/zef\\_dp/zef-dp21-00.pdf](http://www.zef.de/fileadmin/webfiles/downloads/zef_dp/zef-dp21-00.pdf)
- Barry, B., Obuobie, E., Andreini, M., Andah, W., and Pluquet, M. (2005). The Volta River Basin: Comprehensive Assessment of Water Management in Agriculture; Comparative Study of River Basin Development and Management. Draft Report. IWMI Publication. pp 33
- Batchelor, C. (2007). Water Governance Literature Assessment. International Institute for Environmental and Development (IIED). [Available online] <http://www.iied.org/pubs/pdfs/GO2523.pdf> (Accessed: 2/11/2011)
- Biswas, A. K. (2004). Integrated Water Resources Management: A reassessment. Water International, 29 (2): 248-256
- Blaikie, P. (2006). Is Small Really Beautiful? Community-based Natural Resource Management in Malawi and Botswana. *World Development*, 34(11): 1942-1957.
- Bliss, K. E. and Bowe, K. F. (2011). *Bridging knowledge gaps in water management: Integrating Approaches to Food, Water, Energy, and the Environment* Washington/D.C.: Center for Strategic and International Studies. [Available

online][www.ireon-portal.de/.../index.php?...%22Bliss%2C+Katherin...](http://www.ireon-portal.de/.../index.php?...%22Bliss%2C+Katherin...) (Accessed 25/11/2011)

- Bolt, E. and Fonseca, C. (2001). Keep it Working: A Field Manual To Support Community Management of Rural Water Supplies. IRC Technical Paper Series 36.
- CARIUS, A. Dabelko, G. D. And Wolf, A. T. (2004): Water, Conflict and Cooperation, [available online ][http://www.unglobalsecurity.org/pdf/Carius\\_Dabelko\\_Wolf.pdf](http://www.unglobalsecurity.org/pdf/Carius_Dabelko_Wolf.pdf)
- Carson, T. (1998). Chapter 30: Community-Based Natural Resource Management. Environment: ETAP Reference Guide Book. IDRC/MoE. pp 353- 362
- Chen, S. (2008). From Community-Based Management to Transboundary Watershed Governance. *Development*, 51(1), 83-88. Nature Publishing Group. [Available online] <http://www.palgrave-journals.com/doi/10.1057/palgrave.development.1100445> (Accessed: 8/8/2011)
- Devuyst, D. (2001). Introduction to Sustainability Assessment at the Local Level. In D. Devuyst (Ed.). How green is the city? Sustainability Assessment and the Management of Urban Environments: 1-36. New York: Columbia University Press
- Dungumaro, E. W. and Madulu, N. F. (2002). Public Participation in Integrated Water Resources Management: The Case of Tanzania. Paper presented at the 3rd Waternet/WARFSA symposium, 'Integrating water supply and water demands for sustainable use of water resources', Dar Es Salaam. 30-31 October 2002
- Dzakpasu, M. (2008). Institutions for Effective Transboundaury Water Governance in the Volta River Basin: Comparative Learning from Transboundary River Basins in Africa and Asia. M.Sc. Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
- Fatch, J. J. (2010). Local Participation in Transboundary Water Resources Management: The Case of Limpopo Basin, Zimbabwe. M.Sc. Thesis, University of Zimbabwe, Zimbabwe
- Gadgil, M., Berkes, F. and Folke, C. (1993). Indigenous Knowledge for Biodiversity Conservation. *Ambio* 22:151–156
- GEF-UNEP (2002) Volta River Basin Preliminary Transboundary Diagnostic Analysis. Final Report, Project Development Facility (PDF-B), Accra
- Global Water Partnership (GWP). (2000). Integrated Water Resources Management, Technical Advisory Committee Background Paper No 4, Stockholm. [Available online] <http://www.cepis.ops-oms.org/bvsarg/i/fulltext/tac4/tac4.pdf> (Accessed 20/3 2012)
- GSS. (2012). [Available online], <http://www.statsghana.gov.gh/pdf> (Accessed 22/07/2012), Site last updated: Thursday 19th July 2012, 16:27 GMT

- GWP and INBO (2009). A handbook for integrated water resource management in basins. [Available Online] [http://www.siagua.org/archivos\\_adjuntos/documentos/libro\\_gestion\\_cuencas.pdf](http://www.siagua.org/archivos_adjuntos/documentos/libro_gestion_cuencas.pdf) (Accessed 27/9/ 2011)
- Hope, K. R. (2009). Climate change and poverty in Africa, *International Journal of Sustainable Development & World Ecology*, 16:6, 451-461 [available online] <http://dx.doi.org/10.1080/13504500903354424> (Accessed: 6-6-2012, at: 02:52)
- International Conference on Water and the Environment (ICWE). (1992). The Dublin Statement on Water and Sustainable development. Dublin, January 31, 1992. <http://www.inpim.org/files/Documents/DublinStatmt.pdf>
- International Fund for Agricultural Development (IFAD) (2006). Community-based natural resource management: How knowledge is managed, disseminated and used. [Available online] <http://www.ifad.org/pub/other/cbnrm.pdf> (accessed 7/11 2010)
- Iza, A. and Stein. R. (2009) *Rule: Reforming Water Governance*. Gland, Switzerland: International Union for Conservation of Nature and Natural Resources (IUCN).
- Kogo, E. S. (2009). Identifying and Incorporating Indigenous Concepts into Integrated Water Resources Management within the White Volta Basin in Ghana. M.Sc. Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
- Lautze, J., Barry, B. and Youkhana, E. (2006). Changing Interfaces in Volta Basin Water Management: Customary, National and Trans-boundary, ZEF Working Paper Series 16, Bonn, Germany. <http://www.zef.de/workingpapers.0.html>
- Lautze, J., Giordano, M. and Borghese, M. (2005). Driving Forces Behind African Transboundary Water Law: Internal, External, and Implications, International workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', 26-28 January 2005, Johannesburg, South Africa.
- Leach, M., Mearns, R. and Scoones, I. (1999). Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development*, 27(2), pp. 225-247.
- Mehta, L., Leach M., Newell, P., Scoones, I., Sivaramakrishnan, K. and Way, S. A. (1999). Exploring Understandings of Institutions and Uncertainty: New Directions in Natural Resources Management. IDS Discussion Paper 372. Brighton.
- Meinzen-Dick, R. and Knox, A. (1999). Collective Action, Property Rights, and Devolution of Natural Resource Management: A Conceptual Framework. Draft workshop paper, 15 July 1999, Mimeo.
- Ministry of Water Resources Works and Housing (2007) Ghana National Water Policy, Accra
- MoFA [available online] [http://mofa.gov.gh/site/?page\\_id=656](http://mofa.gov.gh/site/?page_id=656), (ACCESSED 2<sup>ND</sup> MAY, 2012)

- Mondello, G. (2006). Policy Setting For Sustainable Water Management: GATS Rules and Water Management Systems. In: In: C. Giupponi; A. J. Jakeman; D. Karssenber and M.P. Hare. eds. 2006. Sustainable Management of Water Resources: An Integrated Approach. Cheltenham: Edward Elgar Publishing Ltd.Ch.2
- Mostert, E. (2006). Participation for Sustainable Water Management. In: C. Giupponi; A. J. Jakeman; D. Karssenber and M.P. Hare. eds. 2006. Sustainable Management of Water Resources: An Integrated Approach. Cheltenham: Edward Elgar Publishing Ltd.Ch.7
- Nwaka, G. I. (undated). Using Indigenous Knowledge to strengthen Local Governance and to counter Urban Inequality in Nigeria [Available online] [www.uib.es/congres/./195Nwaka2.pdf](http://www.uib.es/congres/./195Nwaka2.pdf) (Accessed 14/02/2011)
- Opoku-Agyemang, M. (2005). The Role of District Assemblies in the Management of Trans-District Water Basins in Ghana. Paper presented at the International Workshop on ‘Africa Water Laws: Plural legislative Frameworks for Rural Water Management in Africa’, Johannesburg, South Africa, 26-28 January 2005.
- Opoku-Ankomah, Y., Dembélé, Y., Ampomah, B. Y. and Somé, L. (2006). Hydro-Political Assessment of Water Governance from the Top-Down and Review of Literature on Local Level Institutions and Practices in the Volta Basin. Colombo, Sri Lanka: International Water Management Institute. 36p. (IWMI Working Paper 111)
- Ostrom, E. (1992). Crafting Institutions for Self-Governing Irrigation Systems. San Francisco, Calif: ICS Press.Participatory Learning and Action 60, 11-35.[Available online] <http://re.indiaenvironmentportal.org.in/files/Communitybased%20adaptation%20to%20climate%20change.pdf#page=101>(Accessed online 20/3 2012)
- Reid, H., Alam, M., Berger, R., Cannon, T., Saleemul, H. and Milligan, A. (2009) Community-Based Adaptation to Climate Change: An Overview. Participatory Learning and Action 60, 11-35. [Available online] <http://re.indiaenvironmentportal.org.in/files/Communitybased%20adaptation%20to%20climate%20change.pdf#page=101>(Accessed 20/3/ 2012)
- Rogers, P. and Hall, A. (2003). Effective Water Governance. Global Water Partnership, Technical Advisory Committee Background Paper No 7. Global Water Partnership, Stockholm.
- Sadoff, C., Greiber, T., Smith, M. and Bergkamp, G. (2008). Share: Managing Water across Boundaries. Gland, Switzerland: International Union for Conservation of Nature and Natural Resources (IUCN).
- Salame, L. Swatuk, L. A. and Van der Zaag, P. (2009). Developing Capacity for Conflict Resolution Applied To Water Issues. In: M. W. Blokeland; G. J. Alaerts and J. M. Kaspersma. eds. 2009. Capacity Development for Improved Water Management. London: Taylor and Francis Group.Ch.6

- Savenije, H. H. G. and Van der Zaag, P. (2000). Conceptual Framework for Management of Shared River Basins; With reference to the SADC and EU. *Water Policy* 2:9-45
- Shah, T. and van Koppen, B. (2006) Is India Ripe for Integrated Water Resources Management (IWRM)? Fitting Water Policy to National Development Context. *Economic and Political Weekly* XLI (31): 3413–3421
- Shaibu, S. (2011). Simulation of Runoff for the Black Volta Basin, using Satellite Observation Data. M.Sc. Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
- Sutherland, J. W., Ben, S., Kwame, A. and Osafu-Kissi, A. (2004). Innovative Approaches to Sustainable Hydro Power Production in the Volta Basin—the VRA Initiative. Workshop Paper, Promoting Bilateral Cooperation through Informed Dialog in the Volta Basin, Ho, June 8–10, 2004
- The World Bank. (1999). Report from the International CBNRM Workshop, Washington D.C. 10-14 May 1998. URL:<http://www.worldbank.org/wbi/conatrem/.62>
- United Nations Convention on the Law of Non-navigational Uses of International Watercourses. [Available online] [http://www.thewaterpage.com/UN\\_Convention\\_97.html](http://www.thewaterpage.com/UN_Convention_97.html), May 13, 2012 at 12:21 am
- United Nations Development Programme, UNDP (2006). *Human Development Report 2006: Beyond scarcity. Power, poverty and the global water crisis*, Technical Report. United Nations Development Programme, New York. <http://hdr.undp.org/en/reports/global/hdr2006/>(Accessed 31-5-2012 at 7.58 pm)
- United Nations Economic Commission for Africa (UNECA). (2000). Trans-Boundary River/Lake Basin Water Development in Africa: Prospects, Problems, And Achievements .Addis Ababa. [Available online] [http://www.uneca.org/awich/Reports/Transboundary\\_v2.pdf](http://www.uneca.org/awich/Reports/Transboundary_v2.pdf) (Accessed: 12/11/2011)
- United Nations International Watercourses Convention (UN IWC). (1997). Convention on the Law of Non-navigational Uses of International Watercourses. [Available online] [http://www.thewaterpage.com/UN\\_Convention\\_97.html](http://www.thewaterpage.com/UN_Convention_97.html), (13/5 2012)
- Van de Giesen, N., Andreini, M., van Edig, A. and Vlek, P. (2001). Competition or Water Resources of the Volta Basin. IAHS Publication 268: 99-205.
- Van der Zaag, P. (2005). Integrated Water Resources Management: Relevant concept or irrelevant buzzword? A capacity building and research agenda for Southern Africa. *Physics and Chemistry of the Earth, Parts A/B/C*, 30(11–16), pp. 867-871.
- Van Koppen, B., Giordano, M. and Butterworth, J. (eds.), (2007). Community-based Water Law and Water Resource Management Reform in Developing Countries, CAB International: Comprehensive Assessment of Water Management in agriculture Series 5, Biddles Ltd King’s Lynn, UK

- Vinogradov, S., Wouters, P. and Jones, P. (2003). Transforming Potential Conflict into Cooperation Potential: The Role of International Water Law Paris: UNESCO [Available online] [unesdoc.unesco.org/images/0013/001332/133258e.pdf](http://unesdoc.unesco.org/images/0013/001332/133258e.pdf), (Accessed 2/11/2011)
- Volta-HYCOS. (2006). Volta-HYCOS Project Document: Sub-Component of AOC-HYCOS Project. [Available online] [http://www.whycos.org/rubrique.php?id\\_rubrique=62](http://www.whycos.org/rubrique.php?id_rubrique=62) (Accessed: 21/12/2011 )
- Water Resource Commission (WRC). (2011). [Available online], <http://www.wrc-gh.org/> (Accessed 8/5/ 2010)
- Zeitoun, M. and Jägerskog, A. (2011). Addressing Power Asymmetry: How Transboundary Water Management May Serve to Reduce Poverty. Report Nr. 29. SIWI, Stockholm

## APPENDICES

### APPENDIX A: SURVEY QUESTIONNAIRE

**Kwame Nkrumah University of Science and Technology**



Masters Program in Water Resource Engineering and Management

Civil Engineering Department

#### **Research Questionnaire on Water Resources Use and Management in the Black Volta Basin for community members**

**Name of Community/District**.....

**Name of respondent**.....

**Age**.....

**Sex**.....

**Occupation**.....

**Marital status**.....

**Religion**.....

1. How long have you lived in this community?

[1] Less than 5 year      [2] 5-10 years      [3] 10-20 years      [4] Over 20 years

2. What are the sources of water in this community?

[1] Ground water      [2] River      [3] Pond      [4] others specify

3. What is the major source of water in this community for the following activities?

[1] Domestic uses.....

[2] Field crop irrigation.....

[3] Livestock watering.....

4. How many other communities do you share these water sources with?

[1] None      [2] 1-2      [3] 3-5      [4] Over 5

5. Do you have a water committee in the community?

[1] Yes      [2] No      [3] Don't know

6. What are the local water user groups that access water from these sources?

.....

7. What are the roles and responsibility of the community water committee?

.....

8. How do you mobilize for water resource development in the community?

.....

9. Which of the water sources mentioned above do you need permission to access?

[1] Ground water [2] River [3] Pond [4] others specify

.....

.....

10. Whose permission must be sort before accessing them?

[1] Chief/Rep from chief [2] National water Rep [3] community-based committee [4] None

11. What are some of the water developmental projects undertaken in the community lately?

.....

12. Who decided that the community needed such projects?

[1]Community members sole proposal [2] MP's/Gov. agents/NGO's proposal  
[3] community contribution in kind [4] Joint proposal with community and other

13. How would the community like to finance and support water developmental activities in the community?

[1] Through levy on community members [2] Assistance from Government  
[3] Community contribution in kind [4] NGO

14. Who determines how much water from the river should be allocated to a user for farm and other activities and at what time?

[1] Chief [2] National water Rep [3] community based committee [4] Others specify

15. What are some of the water conflict issues you have had in the community concerning water use and allocation?

.....

16. In times of such situations who is the mediator for resolution and how is it done?

(Probe if external support is solicited e.g. local assembly)

[1] Chief [2] District Assembly [3] Community based committee [4] Others specify

.....

17. What are some of your actions and practices that is negative to the river and resource in it?

.....

18. What are some of the community's actions or initiatives that have been taken to protect the river from pollution and silting up?

.....

19. What are some of the punitive actions meted out to polluters of these water sources and how are these punitive actions developed?

.....

20. Has this community ever had to discuss water quality and quantity concerns with an upstream or downstream community?

[1] Yes [2] No [3] Don't know

21. How was it resolved?

[1] By inter-communities actions [2] By national interventions  
[3] By NGO's intervention [4] others specify

22. Do you think there is the need to be concerned and consult with these communities on how the river should be managed?

[1] Yes [2] No [3] Don't know

23. Have your community had any concerns with how other communities use the river?

[1] Yes [2] No [3] Not aware

24. Do you think there is the need to be concern on how they use the river? Why?

[1] Yes [2] No [3] Don't know

.....

25. How has cooperation with other communities in Burkina Faso be in the use of the river

[1] Very peaceful [2] Somehow peaceful [3] not peaceful

26. Why is the river so important to the community and how best do you think the community can gain much from it in terms of livelihood improvements?

.....

.....

27. What are some of the customs and believes associated with the Black Volta River in the past?

.....

28. Could you explain their significance?

.....

.....  
.....  
29. Are they still relevant now? Why?

[1] Yes [2] No [3] Don't know

30. Has the community ever engaged in planting of trees along Black Volta River before?

[1] Yes [2] No [3] not aware

31. Which Institution initiated the process?

[1] Communities actions [2] District/national interventions  
[3] NGO's intervention [4] others specify

32. Have you ever participated in any meeting on water developmental project?

[1] Yes [2] No

33. What was the meeting about (problems, issues) and which organization put up the meeting?

34. How open and participatory was the meeting? Was everyone happy to share his thought?  
.....

35. What are some of the national and district water related organizations that you are familiar with?  
.....

36. Have you ever heard of the Water Resource Commission (WRC) and do you know of their functions towards the Black Volta River?

[1] Yes [2] No  
.....

37. What are some of the water regulations and laws from national/ district organizations on the use of the river that hinders your livelihood activities?  
.....

38. Do you think the community' social arrangement and traditions of managing water resource should be incorporated in (Inter) national? Why?

[1] Yes [2] No  
.....

39. Which of your local arrangements in water resource management do you propose to be part of national policies?  
.....

40. Informal (local) and formal institutions for water governance, which one do you prefer as most effective for managing water sources?

[1] Informal institutions [2] Formal institutions [3] Mixture of the two [4]  
others specify

.....

## APENDIX B: Population by District and Sex – Upper West Region

	<b>Total</b>	<b>Male</b>	<b>Female</b>
<b>Ghana</b>	<b>24,658,823</b>	<b>12,024,845</b>	<b>12,633,978</b>
<b>Upper West</b>	<b>702,110</b>	<b>341,182</b>	<b>360,928</b>
Wa West	81,348	40,227	41,121
Wa Municipality	107,214	52,996	54,218
Wa East	72,074	36,396	35,678
Sissala East	56,528	27,503	29,025
Nadowli	94,388	44,724	49,664
Jirapa	88,402	41,592	46,810
Sissala West	49,573	24,151	25,422
Lambussie Karni	51,654	24,952	26,702
Lawra	100,929	48,641	52,288

Source: Ghana Statistical Service (GSS), 2012