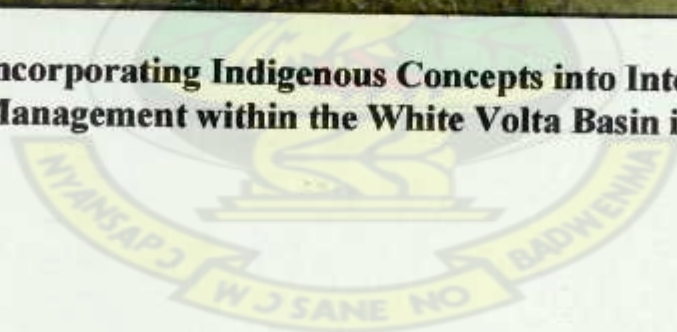


**Kwame Nkrumah University of Science and Technology
Kumasi, Ghana**



**Identifying and Incorporating Indigenous Concepts into Integrated Water
Resources Management within the White Volta Basin in Ghana**



**LIBRARY
KWAME NKUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA**

Emmanuel Sungnumah KOGO

MSc. Thesis
April 2009

**Kwame Nkrumah University of
Science and Technology**



WRESP – KNUST

Faculty of Civil and Geomatic Engineering
Department of Civil Engineering

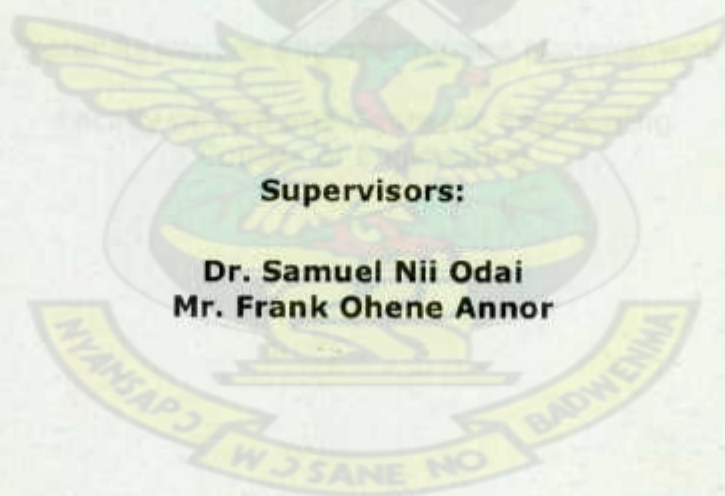
**Identifying and Incorporating Indigenous Concepts into Integrated Water
Resources Management within the White Volta Basin in Ghana**

KNUST

Master of Science Thesis
By
Emmanuel Sungnumah KOGO

Supervisors:

**Dr. Samuel Nii Odai
Mr. Frank Ohene Annor**



Kumasi
April 2009

LIBRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

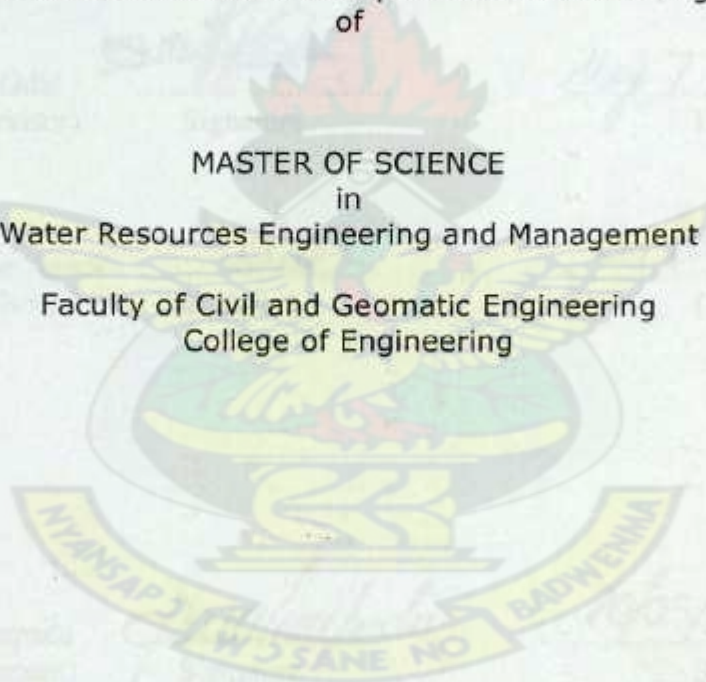
Identifying and Incorporating Indigenous Concepts into Integrated Water Resources Management within the White Volta Basin in Ghana

By

Emmanuel Sungnumah KOGO, BSc (Hons)

A thesis submitted to the Department of Civil Engineering,
Kwame Nkrumah University of Science and
Technology
in partial fulfillment of the requirements for the Degree
of

MASTER OF SCIENCE
in
Water Resources Engineering and Management
Faculty of Civil and Geomatic Engineering
College of Engineering



April 2009

Certification

I hereby declare that this submission is my own work towards the MSc. 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

Emmanuel Sungnumah Kogo
(PG1358107)


.....
Signature

07/05/2009
.....
Date

Certified by:

Dr. Samuel Nii Odai
(Principal Supervisor)


.....
Signature

May 7 2009
.....
Date

Mr. Frank Ohene Annor
(Second Supervisor)


.....
Signature

07/05/09
.....
Date

Certified by:

Prof. S. I. K. Ampadu
(Head of Department)


.....
Signature

10/05/2009
.....
Date

L. BRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

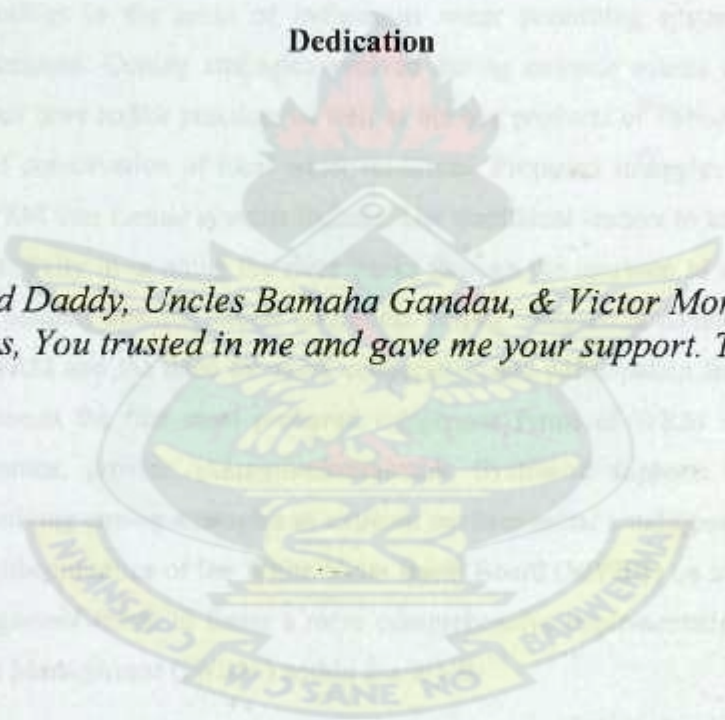
Abstract

The mandate of the Water Resources Commission (WRC) Act in Ghana is to regulate in Ghana the use of the water resources within which all need the ownership of water to be regulated by state, after which, legislative control is given to the regulatory regime. It also has to regulate the ownership, control, and management of water by establishing the WRC. The purpose of this study is to identify and determine effective regulatory forms of Water Resources Management (WRM) and suggest ways of incorporating them into Ghana's Water Resources Management (WRM) within the Volta, Volta River Basin (VVRB) or Ghana. The regulatory forms were identified for the study. Models of governance administration and their impact on water were used to establish the possibilities and solutions of regulatory forms with regard to the WRC. The study also identified the regulatory forms of WRM. The results of the study show that some regulatory forms are more effective than others. The regulatory forms held by individuals are identified to be the most effective. The study also identified the regulatory forms of WRM. The results of the study show that some regulatory forms are more effective than others. The regulatory forms held by individuals are identified to be the most effective.

KNUST

Dedication

To Mum and Daddy, Uncles Bamaha Gandau, & Victor Mombu and all my Siblings, You trusted in me and gave me your support. Thank you.



Abstract

The enactment of the Water Resources Commission (WRC) Act in Ghana in 1996 has in effect abolished the pre-1996 customary regime which allowed the ownership of water to be handled by stools, skins, society, families among others. In place of the customary regime, the state has taken over the ownership, control, and management of water by establishing the WRC. The research aimed to identify and determine effective Indigenous Forms of Water Resources Management (IFWRM) and suggest ways of incorporating them into formal Water Resources Management (WRM) within the White Volta River Basin (WVB) in Ghana. Six communities were selected for the study. Means of questionnaire administration and Focus group discussions were used to establish the perceptions and practices of community members with regards to the White Volta River, and traditional forms of WRM. The results of the study show that some community members perceive strong informal water rights held by traditional authorities in the areas of indigenous water permitting systems and conflict resolution mechanisms. Coping strategies evolved during extreme events of draughts and floods. Indigenous laws and/or practices as well as the bye products of Taboos resulted in the management and conservation of local water resources. Proposed strategies that could help incorporate IFWRM into formal systems include: Use traditional leaders to keep records with regard to every activity in or along the river banks through the issuance of water permits to small scale and peasant farmers; create awareness among indigenous communities on their past efforts in WRM and the need for more cooperation and participation from them and to adopt and implement the first most preferred indigenous forms of WRM identified in the various communities; provide alternative/sustainable livelihood supports to help reduce unsustainable evolving coping strategies to extreme environmental conditions along the river banks; create a subcommittee of the White Volta Basin Board (WVBB) on indigenous water rights and management forms to foster a more comprehensive implementation of Integrated Water Resources Management (IWRM) within the WVB.

Keywords: Integrated Water Resources Management; Indigenous; Traditional; Water Resources Commission; White Volta River; Basin.

LIBRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

Table of Content

Certification	iv
Dedication	v
Abstract.....	vi
Table of Content.....	vii
List of Figures.....	ix
List of Tables	x
List of Plates	xi
List of Abbreviations and Acronyms	xii
Acknowledgements	xiii
CHAPTER ONE	
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Justification of the Project.....	3
1.4 Objectives	5
1.5 Organization of thesis.....	5
CHAPTER TWO	
CHAPTER TWO	6
LITERATURE REVIEW	6
2.1 Indigenous Knowledge	6
2.2 Water Resources Management in Ghana.....	7
2.3 Constitutional Rule and Indigenous Water Rights in Ghana.....	8
2.4 Indigenous Water Rights and Practices	9
2.5 Colonial Influences on Traditional Water Management Institutions.....	11
2.6 Customary Laws and Integrated Water Resources Management (IWRM)	12
2.7 The place of Indigenous Knowledge in WRC's implementation of IWRM	13
2.8 Limitations of Indigenous Approaches to Water Management	16
2.9 The Loss of Indigenous Knowledge	16
CHAPTER THREE	
CHAPTER THREE	18
STUDY AREA.....	18
3.1 Physical Features and Population	18

3.2 Climate.....	19
3.3 Relief and Drainage.....	19
3.4 Vegetation.....	20
3.5 Geology and Soils.....	20
CHAPTER FOUR.....	22
METHODOLOGY	22
4.1 Scope of Study.....	22
4.2 Selection of Study Communities:	22
4.3 Data Collection.....	22
4.3.1 Questionnaire Administration.....	24
4.3.2 Focus Group Discussion.....	25
CHAPTER FIVE	28
RESULTS AND DISCUSSIONS	28
5.1 Local Perceptions and Practices in Water Resources Management.....	28
5.1.1 Ownership and Control of Water Resources	28
5.1.2 Traditional Water Permitting Systems.....	30
5.1.3 Coping Strategies to Draughts and Flood Conditions.....	32
5.1.4 Collaborations with other Institutions	34
5.1.5 Conflict Management and Resolution Mechanisms.....	35
5.1.6 Gender and Water Resources Management.....	37
5.2 Indigenous Systems of Water Resources Management.....	38
5.2.1 The use of Taboos in Water Resources Management	38
5.2.2 Other Indigenous forms of Water Resources Management.....	41
5.3 Suggested Strategies for the Incorporation of IFWRM into IWRM	43
CHAPTER SIX	47
CONCLUSIONS AND RECOMMENDATIONS.....	47
6.1 Conclusion	47
6.2 Recommendations.....	48
REFERENCES.....	49
APPENDICES.....	55
Appendix A.: Composition of the White Volta Board.....	55
Appendix B.: Subcommittees of the White Volta Basin Board and their duties and membership.....	56
Appendix C.: A Schematic Diagram of the Proposed Management of the WVB Depicting a Stronger Collaboration with Community Committees.....	58
Appendix D.: Research Questionnaire	59

List of Figures

Figure 3.1: Map of Upper East Region showing the White Volta Basin and the study communities..... 199

Figure 3.2: Geology and Soils of the Upper East Region (Shape Files Data Source: GVD) (Mdemu, 2008).....21

Figure 5.1 Respondents knowledge of WRC and the role it plays in WRM.....29

Table 5.4: The knowledge of general facts on WRM in the Study Communities..... 34

Table 5.5: Comparison of the Role of of Different Institutions in the Field of WRM..... 32

KNUST



L.BRARY
KWAME NKUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

List of Tables

Table 5.1: Communities perception of Ownership and Control of Water Resources in the White Volta River.....28

Table 5.2: Coping Strategies for the Various Communities in the Event of Draught and Flood Conditions.....32

Table 5.3: The use of Taboos in WRM within the Study Communities.....39

Table 5.4: Traditional/Indigenous Laws in WRM in the Study Communities.....41

Table 5.5.: Communities' Ranking of Preferred Indigenous Forms of WRM..... ..42

KNUST



List of Plates

Plate 4.1: Interview with a Farmer at Baazua community.....	24
Plate 4.2: An Interview with Women at Mognori community.....	24
Plate 4.3: Interview with a Farmer at Kugrasiah community.....	25
Plate 4.4: Farmers Waiting to be Interview at Pwalugu community.....	25
Plate 4.5: A Focus Group Discussion at Mognori community.....	26
Plate 4.6: A Discussion with Farmers/Opinion Leaders on the Bank of the WVR at Sapelliga.....	26
Plate 5.1: Shallow Wells Dug on the Bed of River Atankire for dry season farming..	32
Plate 5.2: A Young Mango Plantation along the WVR at Baazua.....	33
Plate 5.3: Parkisonia spp. Planted along the WVR at Mognori.....	33
Plate 5.4: Vegetable Farm after a Layer of Boundary Planting at Sapelliga.....	33
Plate 5.5: Community Tree Nursery at Mognori.....	33

List of Abbreviations and Acronyms

AfDB	African Development Bank
DDT	Dichloro-Diphenyl-Trichloroethane
EPA	Environmental Protection Agency
FAO	Food and Agricultural Organisation
IDA	Irrigation Development Authority
IK	Indigenous Knowledge
IKS	Indigenous Knowledge Systems
IFWRM	Indigenous Forms of Water Resources Management
IWRM	Integrated Water Resources Management
NEPAD	New Partnership for Africa's Development
MOFA	Ministry of Food and Agriculture
NGO	Non-Governmental Organisation
PAGEV	Project for Improving of Water Governance in the Volta Basin
UER	Upper East Region
UN	United Nations
VRA	Volta River Authority
WRC	Water Resources Commission
WRM	Water Resources Management
WVB	White Volta Basin
WVBB	White Volta Basin Board
WVBO	White Volta Basin Office
WVR	White Volta River
ZOVFA	Zuuri Organic Vegetable Farmers Association

Acknowledgements

I thank the Lord for his favour, grace and love that enabled me stand the storms of life during my entire study period. My sincere thanks and gratitude to my lovely parents, Mr. and Mrs. Kogo, my uncles Dr. Gandau Bamaha and Mr. Victor Mombu and all my siblings for your moral and financial support throughout the entire program and most especially during my research period. I could not have done it without you by my side.

Special thanks go to Dr. S. N. Odai, my principal supervisor for his constructive advice and suggestions, and to Mr. Frank Annor, my second supervisor. You were not only there as a supervisor, you were there as a friend, and most of all like a brother to me. I would like to express my sincere and heartfelt appreciation to Mr Kwaku Adjei, for his advice, contribution and corrections.

I am most thankful to the White Volta Basin Officer, Mr Aaron Aduna and his secretary for their invaluable support during my data collection. No amount of words can express my gratitude to you, for your role as a mentor and a father to me. My sincere thanks go to Mr. Philip Yamba and Mr. Nathaniel Alaba of Zuuri Organic Vegetable Farmers Association (ZOVFA), for their selfless and dedicated assistance that enabled me to reach out to the various study communities. Many thanks go to the registrar and staff of the Upper East Regional House of Chiefs.

To all the lecturers in the Civil Engineering Department, I say a big thank you for your constructive criticisms, advice, and suggestions. To all my colleagues, especially the Upper East research team, led by Dwuodwo Yamoah-Antwi, I say thank you for your contributions that made this research work a reality. Finally I also thank Dr. Barry and Mustapha of the Glowa Volta Project, for providing us with accommodation during our data collection period. All would not have been successful without the able support of Mr. Asare and Mr. Ansere, drivers at the Civil Engineering Department, for carrying us to and from the field site, I say thank you very much and may the good Lord bless you all.

CHAPTER ONE

INTRODUCTION

1.1 Background

Within the past decade, Governments and most Non-Governmental Organizations including the FAO have been concerned with the sustainable use of Water for agriculture and domestic purposes with a particular focus on the promotion of Integrated Water Resources Management. In line with this, the United Nations made a number of declarations in relation to water: International Year of Freshwater, (UN Doc, 2001); International Decade for Action "Water for Life" 2005-2015, (UN Doc, 2004), and at the Third World Water Forum in Kyoto, Japan, indigenous people reaffirmed the fundamental importance of water to their physical, spiritual and cultural existence in the Indigenous Peoples Kyoto Water Declaration, (UNESCO, 2003).

The above mentioned events are among the numerous international initiatives re-enforcing the growing recognition in the international sphere of the importance of water resources to the world, the need to manage it in a sustainable manner, and the role of indigenous people in such management, (O'Bryan, 2007).

Indigenous peoples are most of the world's poorest people who depend on agriculture for a living, and are confronted with poor yields and a greater struggle for survival. This phenomenon drives them to intensify exploitation of their natural resources to increase production leading to environmental degradation. For the rural poor in the developing world, who live on the margins of survival, the consequences of such damage are often particularly devastating.

LIBRARY
AWAME NKURUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

The Volta River Basin (VRB) is home to several indigenous communities with a great store of indigenous knowledge. It covers an area of about 400,000 km² and is the ninth largest basin in Sub-Saharan Africa (Giesen *et al.*, 2003). It is shared by six countries—(Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali & Togo) and is home to some 18 million people (Barry *et al.*, 2005), who depend directly or indirectly on the water resources in the basin.

The White Volta Basin (WVB) which is a sub basin of the VRB, is drained by the White Volta River and its tributaries, and has its source from the north of Burkina Faso; it then flows south-eastwards to the border with Ghana. It covers an area of 106,000 km² and drains much of northern and central Ghana and Burkina Faso. The mean annual run-off of the Ghanaian portion of the basin is 6 km³ on a surface area of 45,804 km² (WARM, 1998).

Indigenous water safety measures within the WVB, has the potential to maintain good quality water and conserve water all year round. The research intends to establish the effectiveness of existing indigenous forms of WRM and suggest ways of incorporating them into formal WRM within the White Volta River Basin in Ghana.

1.2 Problem Statement

The enactment of the Water Resources Commission (WRC) Act (ACT 522) in Ghana has in effect abolished the pre-1996 customary regime which allowed the ownership of water to be held by stools, skins, society, families among others. In place of the customary regime, the state has taken over the ownership, control, and management of water by establishing the Water Resources Commission.

Currently the WRC has established three River Basin Commissions (RBCs) in accordance with internationally accepted water management principles. However, these RBCs are inadequately resourced to administer water resource planning, monitoring and management and to decide on allocation of water resources through a participatory approach in which the participation of communities, local and traditional authorities, District Assemblies, the private sector and NGOs is an important factor. In coping with its task of reaching out to implement its regulations at the river basin level in the country, the WRC faces a dilemma: on the one hand, its duties and powers are far-reaching; on the other hand, its financial and human resources are limited, (Ministry of Works and Housing 2001, and van Edig et al, 2003). The WRC can therefore be described as 'biting more than it can chew', in the sense that it has taken control over all the water resources of the country which it cannot effectively manage.

In line with the objectives of the WRC, the White Volta Basin has for some time now seen a lot of different projects, mostly towards achieving sustainable water resources management and improving the livelihoods of rural poor men and women, (Poolman, 2005). In the past years most of these Water Resources Management programs did not take into consideration the issue of ownership and sustainability of scientifically designed management tools that resulted in non-implementation of designed institutional water management strategies in local communities.

1.3 Justification of the Project

Indigenous Knowledge Systems (IKS) have an element of caution and as such must be acknowledged to have a role in the application of precautionary principles to water resources and environmental management. Such principles emphasize the fact that

anticipating and preventing problems is cheaper than reacting to and trying to rectify them, that is to say 'an ounce of prevention is worth a pound of cure', (Zwane, 2004). These principles provide for action to avert risks of serious or irreversible harm to the environment or water bodies in the absence of scientific certainty about that harm. IKS can therefore be used as a way of providing for the prevention of risks and harm because where scientific enquiry is absent traditional explanation is normally available from communities who have developed knowledge over years through observation of ecosystems or biological species, (Cooney, 2003 and Zwane, 2004).

Community Based Water Resource Management and other approaches to resource management like Integrated Water Resources Management (IWRM) emphasize the principle of community participation. It should however be well known that effective participation comes with an understanding of stakeholders/actors concerned with resource management. It is therefore imperative that managers together with planners, developers, among others and concerned communities understand their respective interests, needs and the state of each other. Such understanding will eventually result in acceptance, consensus and effectiveness of community development, and conservation initiatives/projects, (Zwane, 2004).

Fortunately, more and more development institutions have come to realise that scientifically designed water resources management systems which have been imposed on the rural people have not always worked and thus the need to integrate indigenous practices with scientific knowledge, therefore gearing towards a more comprehensive Integrated Water Resources Management (IWRM).

LIBRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

1.4 Objectives

The research intends to identify effective indigenous forms of WRM and suggest ways of incorporating them into Integrated Water Resources Management (IWRM) within the White Volta River Basin (WVRB) in Ghana.

Specific Objectives

- ❖ Determine local perceptions and practices in water resources management
- ❖ Identify traditional systems of water resources management
- ❖ Suggest strategies for incorporating relevant forms of indigenous WRM into IWRM within the WVRB.

1.5 Organization of thesis

The thesis is organized into six chapters. Chapter 1 introduces the problem, the justification and the objectives of the study. Chapter 2 reviews literature on customary/indigenous practices in Ghana and the emerging challenges in a changing world. Chapter 3 describes the study area. Chapter 4 outlines the methodology. Chapter 5 discusses the perceptions and practices of the study communities and the results of the surveys on indigenous forms of water resources management of the selected communities and how these forms of management operate. It also includes suggested strategies for incorporating these management forms into formal scientifically based management systems. Chapter 6 summarizes the findings and Some conclusions are drawn.

CHAPTER TWO

LITERATURE REVIEW

2.1 Indigenous Knowledge

According to the World Bank (1998), literature on Indigenous Knowledge (IK) does not provide a single definition of the concept. Nevertheless, several qualities differentiate IK largely from other knowledge systems; IK is exclusive to a particular society and people. It is the pillar for local decision-making in areas such as in agriculture, health, natural resource management, among other activities. Johnson, (1992) defined IK as "A body of knowledge built up by a group of people through generations of living in close contact with nature". He went further to state that such knowledge evolves in the local environment, so that it is specifically adapted to the requirements of local people and conditions and that IK is creative and experimental, constantly incorporating outside influences and inside innovations to meet new conditions. It is therefore important to note that understanding customary laws and IK, offers increased opportunity for creating better managerial regimes that takes real local practices into consideration.

Langill, (1999) defined Indigenous people as "the original inhabitants of a particular geographic location, who have a culture and belief system distinct from the international system of knowledge (e.g., the Tribal, Native, First, or Aboriginal people of an area)". Notwithstanding, indigenous people are further characterized by how they interact with their environment, in order that their knowledge can be mobilized for the design of appropriate interventions.

Generally across the world, existing decision-making and management arrangement in local communities are often insufficiently recognized or even overlooked. However, it is a known fact that many local communities have managed their own water supplies and natural resources for thousands of years through indigenous structures they themselves developed. This requires that the provision of water in the needed quantity and quality and at the right time and place through feasible local water management coordination must be welcomed as an absolute necessity, (Bolt and Fonseca, 2001).

2.2 Water Resources Management in Ghana

The prevailing system used in Ghana to regulate the use of its territorial waters, is a combination of traditional set of laws and other legal Acts. Ghana's constitution (1992 Constitution) defines the laws of Ghana to include the Common Law of which the customary (traditional) law is a part. Customary law is defined by the constitution as a set of rules of law, which by custom are valid to particular communities, either in a written form or orally. This includes rules determined by the Superior Courts of Judicature (Article 2, 1992 Constitution). Despite the Constitutional recognition of customary law, such laws or rules often are subordinated to statutory laws (Kumbour, 2002). In Ghana and within the Volta Basin, customs and laws in the traditional sense cover the areas of water conservation, pollution control, protection of catchment areas and protection of fisheries. The enforcement of these laws was vested into traditional chieftain rules, issued by chiefs and traditional priests or priestesses, (Opoku-Ankomah *et al.*, 2006). At the moment the WRC through the 1996 WRC Act (ACT 522) has the right to issue enforcement notices to non conforming parties in water resources utilization.

LIBRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

2.3 Constitutional Rule and Indigenous Water Rights in Ghana

The primary law of Ghana (The 1992 Constitution), is not clear regarding the setting up of institutions for the regulation of water, compared to other related resources such as lands and forestry for which there are established Commissions with the task of managing and coordinating relevant policies in relation to these resources. Notwithstanding that, the Water Resources Commission (WRC) was established in pursuant to the Water Resources Commission Act, 1996 (Act 522), primarily for the management of the water resources of Ghana. Even with the establishment of the WRC, there are several other ministries (forestry, wildlife, energy etc) and agencies which see to the management and/or regulation (directly or indirectly) of water use in Ghana. Customarily, water rights in Ghana were largely considered as part of land rights, this situation remained until the Water Resources Commission Act of 1996 came into being, (Sarpong, 2004).

Since the time of the colonial masters, a number of ministries, departments and agencies of state, such as mining, agriculture, industry, works and housing and transport and related agencies such as the Volta River Authority (VRA), the Minerals and Forestry Commissions and the Irrigation Development Authority were given authority for diverse uses of water which included irrigation, power generation, transportation and for industrial purposes. The authority given these establishments was not meant to eradicate existing customary/indigenous laws at the time but sought to regulate water uses in areas that were not covered by such laws, (Sarpong, Undated).

Community-based water law which is usually made up of a set of informal institutional, socio-economic and cultural arrangements; anchored in the wisdom of time, are entrenched in local controlled structures and normative frameworks of kinship groups, societies, clans and people of common ancestry, (van Koppen *et al.*, 2007). The enactment of the WRC Act has in effect abolished the pre-1996 customary regime which allowed the ownership of water vested in stools, skins, society, families among others. In place of the customary regime, the state has taken over the ownership, control, and management of water by establishing the Water Resources Commission. The commission has a mandate to see to the regulation, management and utilisation of Ghana's water resources and also to coordinate policies concerning them.

2.4 Indigenous Water Rights and Practices

In many regions of the world, peasant and indigenous water management systems constitute the basis for sustaining local livelihoods and national food security. In most Andean countries, for example, indigenous and peasant societies are the major sources of food for the national populations, thereby, necessitating their security of access to water and the means to manage their water resources, (WALIR, 2002).

Water in its different forms such as the sea, rivers and lakes among others, under customary law is regarded as public property not subject to individual appropriation.

The rights to water according to customary law belong to those who were first to harness the source for their use. This right however does not include the right to stop the flow or natural course of the water in other not to deprive those who are located along the natural course of the water, (Bang-OA, 2003).

Management of water as a common property in Borana (Ethiopia) still remains relatively intact to date while the indigenous institutions concerned with the administration of water in the Borana have also sustained their importance. After rainfall (during the wet season) the Boranas' will close their wells and resort to the use of open water sources. During the dry season, herds are successively shifted to more distant ponds and the traditional wells are re-opened to preserve water near the homestead, (Angassa and Oba, 2007).

Customarily, water has been used for domestic purposes, including animal watering as well as for fishing. Notably, little or no customary rules were developed or evolved to cater for issues related to water transport and irrigation. It is well known that customary law has evolved rules for acceptable use of water resources in localities through which rivers or streams flow. In order to forestall conflicts, neighbouring communities with a common river or stream flowing through their territories usually agree on a location for domestic water collection and it is always ensured that enough water is left for the other users in a reasonably clean state, (Sarpong, Undated).

A system of fines, spiritual and traditional values has been efficiently used since time immemorial to ensure observance with regards to customary rules on water usage. In some parts of Ghana, going to the river on certain days is forbidden and farming along the river banks (which is seen to be the resting place of the river gods and their children) is prohibited. Therefore in order not to infuriate the gods, it is the responsibility of the entire community to desist from activities that will negatively impact on the environment. Meting out of punishments was carried out by traditional rulers assisted by the fetish priest and priestesses. These customary rules were not

only efficient in conserving and managing water, but were also enforceable, (Opoku-Agyemang, 2001, Ministry of Works and Housing, 1998a; Ministry of Works and Housing, 1998b; Odame-Ababio, 2002).

2.5 Colonial Influences on Traditional Water Management Institutions

Customary/Indigenous water management practices and institutions in the Volta Basin may have developed and evolved fairly autonomously for many centuries, but have been altered significantly during the British and French colonial era. During the British colonial era, two water-related legislative acts were passed towards controlling the use of water, other than for domestic use but also to ensure the conservation and management of forested areas, as a commodity as well as a resource. The first one was the 1903 River Ordinance, which applied to several rivers including the Volta River System. The second legislation, the 1949 Forests Ordinance, which was intended to regulate the protection of forests, also stipulated that the forest authority must approve construction of a dam or weir in any river and such a construction should not obstruct the flow of water in any forest reserve. Essentially during this period, a foreign British colonial system relating to water management was imposed on those which were pre-existing, which according to Lund, (2008) meant that (at least) two systems of water management—state-sponsored and community-regulated—were concurrently practiced. This resulted in a lot of inconsistencies, and as a colonial master, focus was now given to British colonial policies, (Opoku-Agyemang, 2001, Youkhana *et al.*, 2006 and Opoku-Ankomah *et al.*, 2006).

The onset of Christianity, Islam, the need for institutional restructuring and the introduction of modern technology has also had their toll on customary laws and

practices, (Opoku-Ankomah *et al.*, 2006). For instance, pronouncements by fetish priest that used to be taken with great reverence are now looked at with contempt. It is mentioned that once a British colonial administrator paid a visit to “native” areas of the then Gold Coast (now Ghana) in 1948, he made a couple of observations which were very intriguing. The first was that the “traditional” non-farming day was now Sunday (Christian day of worship), instead of Tuesday as was the indigenous practice and secondly local chiefs and priests were now gaining the recognition as owners rather than the role of being simple custodians of the land (Lund, 2008 and Youkhana, *et al.*, 2006).

2.6 Customary Laws and Integrated Water Resources Management (IWRM)

Integrated Water Resources Management (IWRM) mainly takes into account the water resources (the entire hydrological cycle), water users (all sectoral interest and stakeholders), spatial scale (spatial distribution of water resources and uses) and temporal scale (temporal variation in availability and demand for water resources), (Saveniji and van der Zaag, 2000). Despite the emphasis on “users” in the concepts of IWRM, very little attention has been paid to indigenous peoples and customary water laws in rural communities of developing countries, (van Koppen *et al.*, 2007). The same holds true for the integration of traditional authorities in projects and government programmes in the White Volta Basin and Ghana as a whole.

The above mentioned practice of neglecting indigenous water laws is progressively being blamed on reformers who have mostly sidelined indigenous water laws in their bid to promote IWRM. But this is surprising because a large number of the world’s populace: often self-employed rural poor make use of small amounts of water (guided

by indigenous water laws) as vital inputs to their all-year round agricultural-based occupation for their sustenance and livelihood improvement, which is in line with the core focus of bilateral and global donors; the main financiers of reforms in developing countries, (van Koppen et al., 2007).

Quite recently, the poise with which IWRM was being promoted has started declining. In sub-Saharan Africa, key actors such as the World Bank, African Development Bank (ADB) and the New Partnership for Africa's Development, NEPAD have recognised yet again the need to re-engage communities in areas of investment such as agricultural water management, as well as domestic suppliers, (van Koppen et al., 2007).

2.7 The place of Indigenous Knowledge in WRC's implementation of IWRM

The creation of the Water Resources Commission (WRC) was a significant step by government in 1996 to address the diffused state of functions and authority in water resources management and to integrate the various sectors responsible for water related management issues. The Commission was established by an Act of Parliament (Act 522 of 1996), with the mandate to regulate and manage the country's water resources and coordinate government policies in relation to them.

The commission is comprised of the major regulators and users in the water sector, and provides a forum for the integration and balancing of different interests. The composition of WRC is made up of technical representatives of key institutions involved in water utilization and water services delivery, i.e. Hydrological Services, Water Supply, Irrigation Development, Water Research, Environmental Protection,

Forestry, and Minerals. Traditional chiefs, NGOs and women are also represented in order to take care of civil society interests, (Act 522 of 1996).

The WRC has not been able to address all the different actors in the water sector. The same holds true for the integration of traditional authorities in projects and government programmes. In their bid to implement integrated water resources management using the Basin approach, the WRC has acknowledged the central position of traditional authorities in the protection of water bodies, but has adopted a dual policy on this issue. On the one hand, the WRC acknowledges that customary law and practices in Ghana have existed over the years and cover the areas of water conservation, pollution control, protection of catchments and protection of fisheries, and it attaches great importance to the accomplishments traditional authorities have made in these areas and wishes to make use of their enforcement power and local legitimacy as far as possible. However, on the other hand, the WRC plans to seize the water rights from these traditional authorities, without consultation with them or compensating them for potential revenue losses, (Opoku-Agyemang, 2001 and Odame-Ababio et al., 2003).

At the moment, the WRC is not present in all the communities of Ghana, which means that in the absence of efficient state monitoring and local enforcement agencies, the WRC will have to count on the work and cooperation of traditional authorities, whose positions and powers are now being weakened by the creation of the Commission itself. The WRC therefore has a task of working towards securing the cooperation of traditional authorities rather than their displeasure. It will be expedient to provide incentives for traditional institutions to enhance their cooperation with the

WRC. Until such cooperation is strengthened and sustained, the WRC will find it difficult, if not impossible to implement IWRM within such/these communities.

In order to bring IWRM closer to the local communities, the White Volta basin secretariat was established through the mandate of the Water Resources Commission and is solely responsible for managing and regulating the use of the White Volta resources in Ghana. Its mission is to regulate and manage the sustainable utilization of water resources and to coordinate related policies through effective participation, monitoring and awareness creation for socio-economic development of the White Volta Basin and Ghana as a whole. A number of projects have been undertaken within the Basin; however there is still inadequate knowledge about traditional practices in water resources management which suggest the need for research into Traditional Systems of Managing Water Resources, (Personal Communication with the White Volta Basin Officer. Mr. Aaron Aduna, 2008). The White Volta Basin Board (WVBB) is made up of 17 members. [See Appendix A].

The Basin Officer appointed by the Commission (WRC) is in-charge of the administration of the secretariat and also act as Secretary to the Board (ex-officio member). Members of the Board have the mandate to appoint a Vice-Chairperson from among their number. Four subcommittees have been formed within the membership of the board to cover the areas of (a) Programmes and budget, (b) Landuse, research, education and public awareness, (c) Environment, utilization and regulation and (d) Transboundary issues. It is quite surprising that none of the subcommittees has a clear mandate to handle issues emanating from indigenous rights and water management (see Appendix B). According to the basin officer, the

Landuse, research, education and public awareness subcommittee as part of its duties is supposed to conduct research into indigenous water related management forms, but such research is yet to be realised. This realisation may lead one to ask "how integrated is the much talked about IWRM?"

2.8 Limitations of Indigenous Approaches to Water Management

Most often than not, many advocates of community-based approaches have sometimes failed to consider the diversity of natives involved in the use and management of water resources in local communities, together with the complex systems through which they compete and collaborate with each other, (Bruns, 2005).

That there are major impediments to the application of traditional beliefs and values to current situations cannot be over emphasized. It is increasingly being realized that the Volta's inhabitants currently face conditions of considerably greater water stress than was before. Apart from that, the basin has also seen a significant increase in population as well as in economic development than before which clearly indicate that customary practices of allowing one to take as much water as he or she can carry may no longer be sustainable in the face of the basin's evolving conditions. Another drawback is the realization that, direct consumption of water abstracted from the river may be highly unsafe, (Youkhana, et al., 2006).

2.9 The Loss of Indigenous Knowledge

The gradual loss of Indigenous knowledge can be attributed to the increasing changes in the environment, and society as well as the changing economic and political dispensation throughout the world. Throughout the past 150 years, a potentially

important vehicle for water resources management: traditional institutional arrangements, has undergone significant changes in the Volta basin, in Ghana. It is a common observation in recent times that younger generations are increasingly adopting different values and ways of life due to the effect of globalization and public influence. Such adaptations are increasingly affecting sustainable indigenous systems of management which has led to a decreased resilience of our ecosystems.

Another drawback is that customary means of transferring knowledge are also disappearing since the older generations get deceased without passing on their store of knowledge to the younger generations. Even the existence of indigenous people in some places is being threatened whilst the role of traditional leadership is being seriously challenged, (Langill, 1999, Opoku-Ankomah et al., 2006 and Malzbender, et al., 2005).



LIBRARY
KWAME NKROMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

CHAPTER THREE

STUDY AREA

3.1 Physical Features and Population

The Upper East Region is located at the north-eastern corner of Ghana. Its geographic coordinates are latitudes $10^{\circ} 15'$ and $11^{\circ} 10'$ north and longitudes 0° and 1° west. It shares boundaries with two countries: Burkina Faso to the north and Togo to the east. It is also bordered internally to the west by the Sissala in the Upper West Region and to the south by the West Mamprusi District in Northern Region. The land is relatively flat with a few hills to the East and Southeast. The total land area is about 8,842 sq km, (GSS, 2002; Min. of Local Govt., Rural Dev. & Environment, 2006).

The region has nine administrative districts: Bolga, Bongo, Builsa, Kasena-Nankana East, Kasena-Nankana West, Talensi-Nandam, Bawku West, Bawku East and Garu Tempani Districts; of which communities in the Bawku Municipality, Garu Tempani District, Bawku West District, Talensi-Nandam District and Kasena-Nankana District were selected for the survey. The region has a population of 920,089, and with a population density of 104 persons per square km, the region exceeds the national average of 79 persons per square km. The relatively favourable soil conditions for agricultural production in parts (valley bottoms) of the region may be the reason for this occurrence, (GSS, 2002 and Birner et al., 2005).



Figure 3.1: Map of Upper East Region showing the White Volta River and the study communities.

3.2 Climate

Rainfall in the region is uni-modal and occurs from May to October. The mean annual rainfall ranges between 800 mm and 1,100 mm. The rainfall is erratic in space and in duration. The region experiences a long spell of dry season from November to mid April, characterized by cold, dry and dusty harmattan winds. Temperatures during this period can be as low as 14 degrees centigrade at night, but can go to more than 35 degrees centigrade in the daytime. Humidity is very low making the daytime high temperature less uncomfortable, (Bimer *et al.*, 2005; Min. of Local Govt., Rural Dev. & Environment, 2006).

3.3 Relief and Drainage

The region is drained mainly by the White Volta, Red Volta and Sissili Rivers. The topography of the area is mostly flat to gently undulating. Slopes range between 1-5%, with only some upland areas where slopes may reach 10%. Generally, the relief consists of gentle undulating plains, broken in some places by hills or ranges formed either by outcrops of resistant Birimian rocks or by granite rock intrusions. Also

present are formations of Voltarian sandstone, (Mdemu, 2008; Min. of Local Govt., Rural Dev. & Environment, 2006).

3.4 Vegetation

The natural vegetation consists of the savannah woodland and is characterised by short scattered drought-resistant trees and grasses that get burnt by bushfire or scorched by the sun during the long dry season. Ecological interference by man has had a significant impact on the environment and this has led to a near semi-arid climate condition in the easternmost parts. The region has the highest density of cattle and this result in overgrazing, most especially in areas close to ponds and dam sites, (IFAD, 1991). The most common economic trees are the sheanut, dawadawa, baobab and acacia species. Some of the common grasses are *Andropogon gayanus* mostly found in less eroded areas; *Hyperrhenia spp.*, *Aristida spp.* and *Heteropogon spp.* which are found around the severely eroded areas, (IFAD, 1991 and Min. of Local Govt., Rural Dev. & Environment, 2006).

3.5 Geology and Soils

The geological formations covering the Upper East Region are mainly divided into three groups, the Granitic, Voltaian, and Birimian rocks. The region's soil is mainly developed from the granitic rocks. The soils are predominantly light textured with heavy textured soils confined to valley bottoms. Apart from these valley bottoms, soils are mostly shallow and low in fertility, with low organic matter content, and are primarily coarse textured. Valley bottoms are characterized with soils ranging from sandy loams to salty clays. These valley bottoms have higher natural fertility but are more difficult to till and are susceptible to seasonal water logging and floods. Apart

from the valley areas, there are also considerably large areas of shallow concretionary and rocky soils with low water holding capacities which do not support active agriculture (Quansah, 2005 and Min. of Local Govt., Rural Dev. & Environment, 2006).

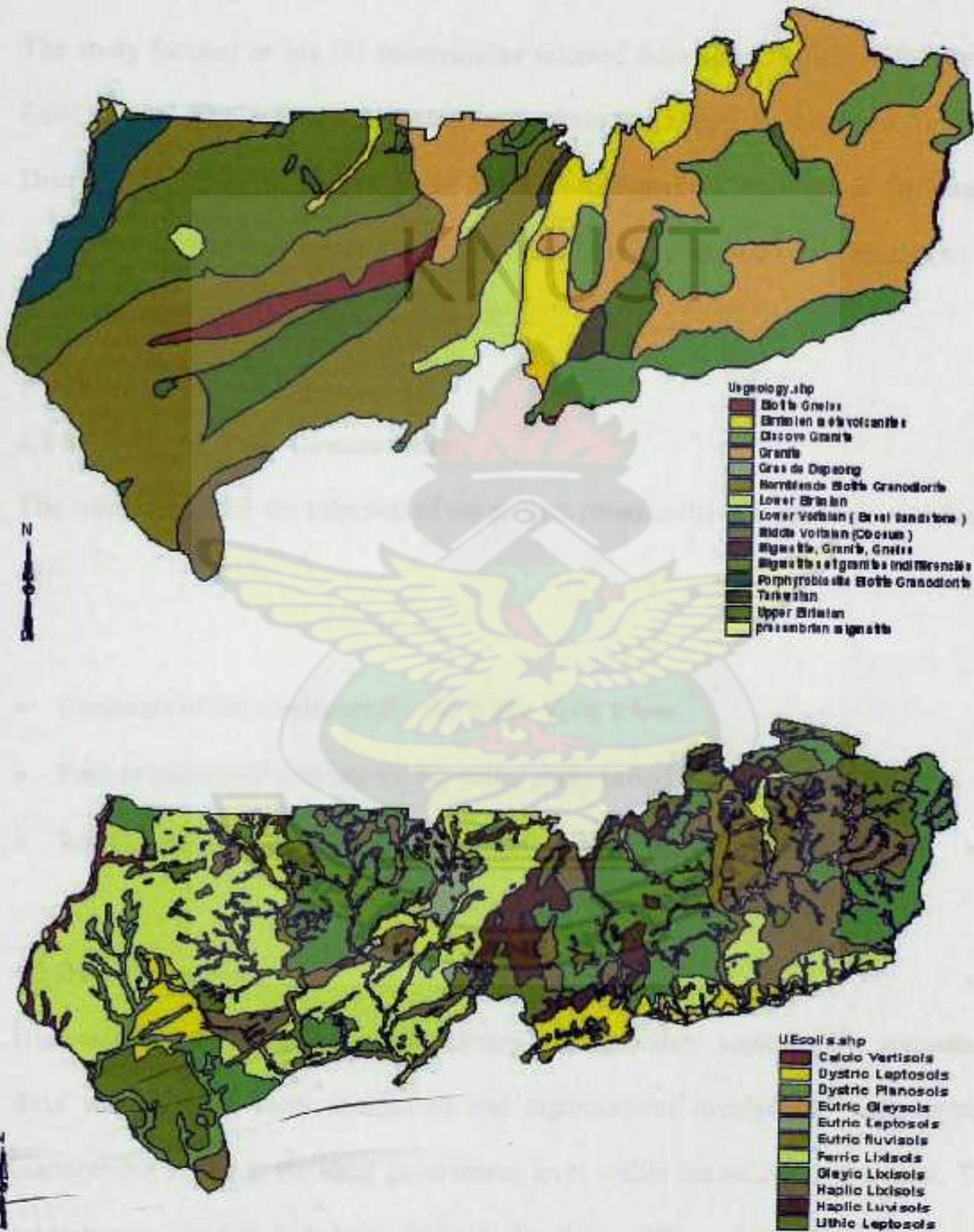


Figure 3.2.: Geology and soils of the Upper East Region (Shape files data source: GVD) (Mdemu, 2008)

CHAPTER FOUR

METHODOLOGY

4.1 Scope of Study

The study focused on six (6) communities selected from five Districts in the Upper East Region. The selected communities include Kugrasiah in the Garu Tempani District, Mognori and Baazua in the Bawku Municipality, Sapelliga in the Bawku West District, Pwalugu in the Talensi-Nabdam District and Atankire (tributary to the White Volta) in the Kassena-Nakana District.

4.2 Selection of Study Communities:

The criteria used for the selection of the project communities for the study was based on:-

- Closeness of the community to the White Volta River
- Ease of accessibility to site for the entire study period.
- Relative stability of the community (conflict zones were not considered)

4.3 Data Collection

Data was basically collected from primary and secondary sources. The **secondary data** was gathered from institutions and organizations involved in water related management issues at the local government level within the study communities. The institutions visited included the White Volta Basin Office of the Water Resources Commission (WRC), Environmental Protection Agency (EPA), Lands Commission, House of Chiefs, Zuuri Organic Vegetable Farmers Association (ZOVFA) and the

Ministry of Food and Agriculture (MOFA). Information gathered from the various offices included laws and regulations related to water management at the national and local government levels: Operational guidelines of the White Volta Basin Board, Ghana Water policy (2007), Water Resources Commission Act (1996), Project for Improving Water Governance in the Volta Basin (PAGEV Reports, 2007), Water Use Regulations (L1 .I. 1692, 2001), as well as peer reviewed reports on research works carried out within the Basin.

The **primary data** was collected by means of key informant interviews using semi-structured questionnaires and focus groups discussions in the study communities. Data collected using these methods were on the perceptions and practices (a-f) and traditional forms of WRM (g) of the study communities and specifically covered the areas of:

- a) Ownership and control of water resources
- b) Traditional water permitting systems
- c) Coping strategies to draught and flood conditions
- d) Collaborations with other institutions
- e) Conflicts and methods of conflict resolution
- f) The role of gender and water resources management
- g) Traditional systems of water resources management
 - i) The use of taboos as a means of protecting water resources
 - ii) Other traditional forms of management

4.3.1 Questionnaire Administration

The questionnaires were administered in the same selected communities before the focus group discussion. The interviewees were randomly selected and cut across the profiles of the study communities to include headmen/chiefs and other inhabitants especially farmers. This was conducted using a semi-structured questionnaire, meaning that only a few questions were kept in mind, leaving enough flexibility to go further into side-tracks, while at the same time preventing the interview from floating in every direction, (Bolt and Fonseca, 2001).

Interviewees were approached either at their homes or workplaces; in this regard their farms, since almost all members of the study communities were involved in farming activities one way or another. We first of all apologized to them for interrupting with their work and explained the reason for our visitation. Where audience was granted, the team went ahead to ask questions on the subject matter and the answers recorded. This was however not so much welcomed in the raining season since farmers were not willing to stop their work and answer questions. As a result, a follow up exercise was made in the dry season to compensate for data collected in the rainy season. Twenty questionnaires were administered randomly in each of the study communities giving a total of 120 questionnaires in all.



Plate 4.1: Interview with a farmer at Baazua community



Plate 4.2: An interview with women at Mognori community



Plate 4.3: Interview with a farmer at Kugrasiah community



Plate 4.4: Farmers waiting to be interviewed at Pwalugu community

Over 80% of farmers in the study communities are peasant farmers and almost all of them rely on water from the White Volta River for dry season vegetable farming among others. Based on the definition by Johnson, (1992) that IK is "a body of knowledge built up by a group of people through generations of living in close contact with nature", it was assumed that IK was common knowledge to the community dwellers, especially those whose livelihoods are tied around water from the White Volta River and hence the conviction that a sample size of 20 questionnaires per community could yield effective results.

4.3.2 Focus Group Discussion

The discussions involved gathering together seven or eight people knowledgeable in the topic or having a particular interest in it. Selection of knowledgeable persons on the topic was facilitated by a technical officer at the Zuuri Organic Vegetable Farmers Association (ZOVFA), Mr. Nathaniel Alaba and the White Volta Basin Officer, Mr. Aaron Aduna. The research team was led to the selected communities by Mr. Nathaniel Alaba. At each community, the team was received by either the headman or the chief's representative. The members constituting the focus group was mostly made up of the headman/chief/chief's representative, two elders, secretary and

chairman of the river bank committee, farmers association and/or Local Trans-boundary Committee on PAGEV, (which ever was applicable), two ordinary members of the river bank committee and in some communities one or two elderly women.

The research candidate served as the moderator during the focus group discussion while an assistant moderator was responsible for taking records of the proceedings. The group was first welcomed by the moderators through an interpreter (Mr. Nathaniel Alaba) and the purpose of the discussion explained to them. Specific questions on the subject matter were then thrown to the group for discussion; everyone was given the chance to speak. Whatever that was said was summarized by the moderator and interpreted for the hearing of all.



Plate 4.5: A Focus Group Discussion at Mognori community



Plate 4.6: A Discussion with farmers/opinion leaders on the bank of the WVR at Sapelliga community

When the questions were exhausted, the moderators thanked the participants and distributed the honorarium (incentive). After all the participants had left, the moderators debriefed for a while to make sure that all information was well documented and then moved to the next community. The discussions took between 30 to 45 minutes to complete. Information gathered through the focus group discussions were then later used to verify data collected through the questionnaires.

KNUST



Committees	Ownership of water resources	Control of water resources
Ministry	Govt (100%) Government (100%)	DAW (100%) Government (100%)
Regional	Regional Government (100%)	Regional Government (100%)
District	Govt (100%)	Govt (100%)
Localities	Local Government (100%)	Local Government (100%)
Communities	Communities (75%), Local Govt (25%)	Local Government (100%)
Private	Private (100%)	Private (100%)

CHAPTER FIVE

RESULTS AND DISCUSSIONS

5.1 Local Perceptions and Practices in Water Resources Management

5.1.1 Ownership and Control of Water Resources

Out of the six study communities visited, all the respondents in four of them (Baazua, Kugrasiah, Atankire and Pwalugu) regarded the traditional authorities as having absolute control to water rights. Respondents from these four communities did not attribute ownership of the river to the government and seem not to be aware that the government and therefore WRC have taken up the management and allocation of Ghana's water resources. Interestingly, 11 of the 20 respondents at Sapelliga acknowledged that the water in the river belonged to the government while one (1) of the 20 respondents at Mognori also acknowledged that the water belonged to the government as well. Similar findings have also been reported by van Edig *et al.*, (2003) in a study conducted in the Volta Basin. The table below shows the perceptions of respondents in the various communities on who owns and control water resources in their respective communities.

Table 5.1: Communities perception of ownership and control of water resources in the White Volta River

Communities	Ownership of water resources	Control of water resources
Mognori	God (19), Government (1)	Chief/Landowner (20)
Kugrasiah	Headman/landowner (20)	Headman/landowner (20)
Pwalugu	Chief (20)	Chief (20)
Atankire	Chief/landowner (20)	Chief/landowner (20)
Sapelliga	Government (11), Landowner (9)	Landowner(20)
Baazua	Landowners (20)	Landowners (20)

Those who believed that government was the custodian of water resources in Ghana were uncertain as to how government was involved in the management process. Fig 5.1 below shows the views of 20 randomly selected respondents from each community regarding their knowledge on WRC and the role they play in WRM.

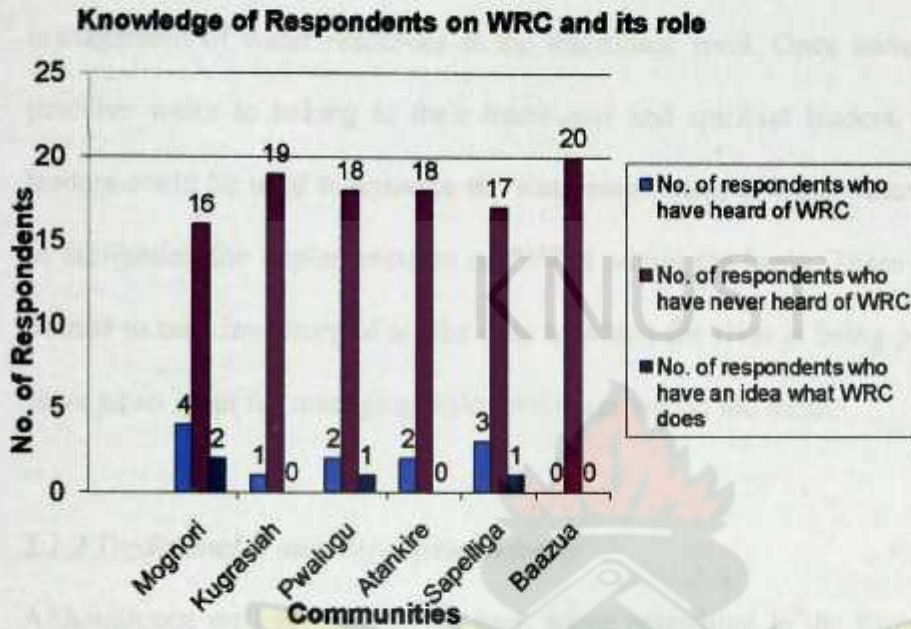


Fig 5.1 Respondents knowledge of WRC and the role it plays in WRM

According to the chief's representative in Mognori, the inhabitants believe that God owns the river. However the land on which the river flows belong to the Tindaana and is held in custody for them by the chief. Therefore any farmer who wishes to crop along the banks of the river has to inform the chief and the Tindaana (land priest) before access was granted. This practice enabled traditional leaders to keep a watchful eye over landuse and could therefore stop negative environmental practices from escalating. The inhabitants of Kugrasiah, Baazua and Atankire believe that the water in the river belongs to the land owner on whose portion of land the river flows and the

headman/chief of the community, whilst the inhabitants of Pwalugu also believe that the river belongs to the chief.

The perception of the community members is a very important concern for management of water resources at the traditional level. Once community members perceive water to belong to their traditional and spiritual leaders, these traditional leaders could be used to enhance the state monitoring of water resources as a means of facilitating the implementation of IWRM within the basin. These leaders could be trained to take inventory of all the uses to which the river is being put to, which will serve as an input for managing water resources within the basin.

5.1.2 Traditional Water Permitting Systems

Although not well defined, in the past, water permitting in the Kugrasiah, Sapelliga and Baazua communities could be said to have been initiated after the customary right had been performed. In Kugrasiah for instance, this started with a farmer informing the Headman and landowners about his interest to undertake dry season farming along the banks of the river, after which a ritual was performed to the gods on behalf of the said farmer. The process was repeated for individual farmers who were interested in farming along the river bank in the dry season.

After the customary rights, farmers were allowed unlimited access to water in the river for the entire dry season cropping period. This practice has within the past decade received a slight modification in the Kugrasiah community, due to an increasing demand for access to water resources; presently the traditional authorities perform the rituals ahead of time so that without seeking for permission farmers are

allowed to crop along the river banks. The current practice does not allow traditional authorities the opportunities to monitor what use the land and water resources are being put to, and could result in misuse and/or abuse of the water resources.

In the remaining study communities, (Mognori, Pwalugu and Atankire) individuals presently abstract water as much as needed for their daily use. Although the river used to dry up in past years, there seem to have been no traditional institutional arrangement for water permitting even during periods of water stress. Abstraction of water in past years and at present is not limited to volume or time but is allowed as long as water is available. This is probably as a result of low population levels of the study communities as well as the peasant nature of their farming systems which does not require large amounts of water, thereby resulting in reduced pressure on the available water resources.

However, as mentioned by Youkhana, *et al.*, (2006), it is increasingly being realized that the Volta's inhabitants currently face conditions of considerably greater water stress than was before. The basin has also seen a significant increase in population as well as in economic development than before. Therefore customary practices of allowing one to take as much water as he or she can carry or use may no longer be sustainable in the face of the basin's evolving conditions.

In order therefore to ensure the sustainable utilization of the WVR and its resources, traditional authorities could also be trained and assisted to issue water permits to peasant and small scale farmers and/or water users within their jurisdiction. Such

process will bring about orderliness in the use of the river and its resources as well as provide information on the extent to which the river is utilised. This will also serve as an input in water resources management towards the implementation of IWRM within the basin.

5.1.3 Coping Strategies to Drought and Flood Conditions

During periods of floods when the sediment load is greatest in the river, farmers in the Kugrasiah community dig shallow wells at the edges of the river floodplains to access clearer and relatively cleaner water for drinking and cooking. In past years, during periods of drought, farmers dug in the river bed for water to irrigate their crops. This practice was recorded in four out of the six study communities. The practice has since stopped in many river bank communities, due to regular releases of water from the Bagre dam in Burkina Faso which leaves water in the White Volta River virtually all year round.

Table 5.2: Coping strategies for the various communities in the event of drought and flood conditions

Communities	Drought conditions	Flood conditions
Mognori	Shallow wells on river bed for domestic water supply	<ul style="list-style-type: none"> ▪ Tree planting along river banks to stabilise the banks
Kugrasiah	Shallow wells on river bed for domestic water supply	<ul style="list-style-type: none"> ▪ Tree planting along river banks to stabilise the banks ▪ Shallow wells at homes for domestic water supply
Pwalugu	Shallow wells on river bed for domestic water supply	<ul style="list-style-type: none"> ▪ No flood adaptation measures recorded
Atankire	Shallow wells on river bed for domestic water supply	<ul style="list-style-type: none"> ▪ No flood adaptation measures recorded
Sapelliga	N/A	N/A
Baazua	N/A	<ul style="list-style-type: none"> ▪ Shallow wells at homes for domestic water supply

N/A – Not Applicable



Plate 5.1: Shallow wells dug on the bed of River Atankire for dry season farming

Under the PAGEV project, the Mognori, Sapelliga and Kugrasiah communities have engaged in river bank protection initiative by planting flood control trees along their stretches of the White Volta. This initiative also serves to prevent encroachment on the river banks as a means of preventing flooding which is becoming a seasonal occurrence. The high levels of community participation and their contribution of labour and local materials towards achieving the objectives of the PAGEV project gives an indication that when local people understand and are involved in formalized scientific interventions, they will cooperate and participate in such projects towards their livelihood improvement.



Plate 5.2: A young mango plantation along the WVR at Baazua

Plate 5.3: Parkisonia spp. Planted along the WVR at Mognori



Plate 5.4: Vegetable farm after a layer of boundary planting at Sapelliga

Plate 5.5: Community tree nursery at Mognori

This confirms the opinion of Parotta, (2008); that knowledge developed and adapted to changing environmental conditions over generations represents an important source of adaptive capacity for indigenous communities to sustain their livelihoods and culture in the face of varying climatic conditions. However, such survival techniques may evolve at the expense of sound environmental or water resources management.

In a bid therefore to support the smooth implementation of IWRM, communities along the WVR should be supported with alternative/sustainable sources of livelihoods. This will ensure that community members stop or minimize drastically the unsustainable exploitation of resources which they have evolved due to an increasing harsh environmental condition within the region.

5.1.4 Collaborations with other Institutions

Traditional institutions (chiefs, elders and the land priest or Tindaana), within the past years controlled the physical and spiritual protection of the river. This practice has however seen a slight change along the line to include unit committees and assemblymen at the local government level. Presently, there are local committees responsible for the management of the White Volta River banks in Sapelliga, Mognori and Kugrasiah communities. These committees which were formed under the PAGEV Project in partnership with ZOVFA and WRC are known as River Bank Committees. Their responsibilities include educational campaigns on the need to protect the White Volta River through planting of trees along the banks on their portion of the river.

Apart from the river bank committees, Sapelliga, Mognori and Kugrasiah communities also have representatives in the Local Trans-boundary Committee on

PAGEV, between Ghana and Burkina Faso. Farmer Groups also exist in these communities and are at various stages in partnership with MOFA and Technoserve in water management and community livelihood improvement projects (pump vegetable irrigation). The various committees and associations have laid down regulations that guide their operational activities. This is a demonstration that traditional leaders and their subjects, often acting together with formalized institutions (Government and NGO's alike), can and do manage their water resources as well as enforce regulations which they put in place.

Many communities are ready to cooperate with the scientific world at the moment. This agrees with the opinion of Parotta (2008) that, lack of mutual understanding and the failure of scientists to obtain adequate consent and ensure benefit sharing when exploiting traditional knowledge in the past had prevented cooperation and the successful exchange of knowledge between scientists (formalized institutions) and community dwellers. This means that community members will likely cooperate with government and non-governmental organisations towards the implementation of IWRM. However care must be taken not to undermine the norms and beliefs (including their indigenous forms of managing resources) of the basin communities as this could slow down the implementation process of IWRM.

5.1.5 Conflict Management and Resolution Mechanisms

Apart from the Baazua community (in the Bawku Municipality), no conflict situation was mentioned over the use of water. Respondents at Baazua were not happy that a proposed large scale irrigation scheme was being undertaken in the upstream

community of Kobore without notifying them. Their fear is that flows downstream will be affected once the scheme comes into operation.

The issue was first reported to the local chief, who in turn reported it to the paramount chief of the Bawku Traditional area and subsequently to the White Volta Basin officer. The reason why the chief of Baazua could not resolve the conflict alone but had to report to the paramount chief of Bawku Traditional Area was because he had no jurisdiction over the Kobore community, which is also located in a different district (Bawku West District). Since both community leaders are subjects to the paramount chief of the Bawku traditional area, it was therefore only right for the chief of Baazua to first report the conflict situation to the paramount chief before any other consideration. An amicable solution is yet to be arrived at between the two feuding communities and WRC. Irrigation Development Authority are purported to be the initiators of the mentioned project which has resulted in the above mentioned conflict.

The absence of conflicts in the other communities could be as a result of less pressure on water resources due to low population levels. However elders of the various communities agreed that the responsibility for conflict resolution lies on the chief/headman or lords of the land (Tindaana). However transboundary conflicts (i.e. between two or more communities) that cannot be resolved by the leaders of the communities concerned according to the elders are to be referred to the Paramount chief of the traditional area where an amicable solution will be found to the problem.

According to Barry *et al.*, (2005), the mastery of local knowledge in water management, and the understanding of the sources of conflicts are necessary for the

elaboration of sustainable projects and as a result favour partnership between traditional and modern water resources management. Sarpong (undated) and Malzbender, et al., (2005) also noted in their researches that in the past, disputes arising out of the use of water in the Volta Basin were resolved by the chiefs and elders in line with the prevailing rules or practices and also went ahead to state that for traditional water governance structures to be fully effective, requires the acceptance that water disputes be settled through traditional authorities. Although a conflict situations was recorded in only one of the study communities (i.e. Baazua), members of the other study communities perceive and accord the respect and duty of conflict resolution to their traditional leaders. This means that they are most likely to submit themselves to local authorities for judgment, should they find themselves culpable. As a result traditional authorities could be used as the first option to in resolving conflicts arising from water and related issues in the IWRM framework within the basin.

5.1.6 Gender and Water Resources Management

In all the study communities, the roles and responsibilities of men and women, regarding access to land and water resources were clearly defined, whereas their roles and responsibilities in the management of the water resources was not defined. Ownership of land and water resources was only limited to males as well as decision making powers. Women could only get access to the property of their husbands with permission sought from him. This practice of ownership of property is still in practice. Opoku-Ankomah et al., (2006) also worked in the Volta Basin and reported that in traditional pre-colonial Burkinabe (and to an extent Ghanaian) societies, although women were denied land ownership in most ethnic groups and kept away from

decision-making processes, they had their own access to water sources, particularly for domestic use.

In recent times however, women are now agitating for recognition to ownership of land and water resources. This democratic legitimacy of informal institutions and the way disadvantaged or underprivileged social groups such as women, the poor, ethnic minorities or youths are represented and treated by traditional authorities poses an important problem, (van Edig et al, 2003). Women may have access to key resources, but if they lack control, then they have little say when decisions need to be made or when resources are threatened, (PAGEV, undated). Therefore in the implementation of IWRM, community members should be educated to see the importance of women in contributing to resource management and community development as a way of making the views of women acceptable in the predominantly male dominated society.

5.2 Indigenous Systems of Water Resources Management

5.2.1 *The use of Taboos in Water Resources Management*

Apart from the Kugrasiah and Baazua communities where taboos are partly being enforced presently, taboos in the remaining four study communities are either not respected or not enforced. Farming close to the river bank was prohibited in the Kugrasiah and Baazua communities and even for those farmers whose crop lands were a distance away, cropping was illegal not until a ceremony of pouring libation to the gods had been performed. Failure to comply with the taboo is punishable within a range of fines to banishment from the community. Scientifically, this procedure allowed the traditional authorities to ensure that farmers did not farm close to the river bank (which could result in siltation of the river), as well as a form of monitoring of

farm lands and the accompanying farming practices. The practice still holds true today but with a slight modification in Kugrasiah. In the past the ceremony was performed on individual farmer basis, however, the ceremony is now performed at the beginning of every farming season, without waiting for any farmer to make a request to crop on the river banks. This development does not allow for effective monitoring of the farming practices carried out on the banks of the White Volta River.

In Mognori community, it was a taboo to see the bottom of the river whilst one was farming. A violation of the taboo was followed by sacrifices to appease the gods, lest he/she dies. In some cases the culprit was fined or banished from the community. This taboo from the community's perspective was to ensure that farmers were not attacked by wild animals, which were abundant at the time around the river banks, or washed away by floods which could occur at any time without warning. Scientifically, farming close to the river bank will result in increased erosion which will lead to siltation and reduction in the volume of water to the point that the river bed is exposed. However, during extreme draught conditions, farmers would dig the river bed to access water as a means of survival. Grooves along the river banks were sacred and could only be felled after accomplishment of rituals. Also crocodiles in the river were not to be hunted for since they were revered as sacred.

These regulatory measures ensured that the water body and its resources were adequately protected from human impacts. These practices are no longer adhered to, which the respondents attributed to the influence of religions modern to the area. As a result of this, the local inhabitants are becoming less and less afraid of the consequences of disobeying taboos.

Table 5.3: The use of taboos in WRM within the study communities

IFWRM	Taboos
Mognori	<ul style="list-style-type: none"> ▪ No one must see the bottom of river ▪ Crocodiles hunt forbidden
Kugrasah	<ul style="list-style-type: none"> ▪ Pour libation before cropping ▪ No logging or farming around sacred grooves
Pwalugu	<ul style="list-style-type: none"> ▪ River is a god ▪ No logging or farming around sacred grooves
Atankire	<ul style="list-style-type: none"> ▪ N/A
Sapelliga	<ul style="list-style-type: none"> ▪ N/A
Baazua	<ul style="list-style-type: none"> ▪ River is a god

In the Pwalugu community, the river was traditionally revered as a god and sacrifices were performed at certain periods to the river god as a sign of respect and to seek for protection and help in times of need. Therefore nobody dared do anything to anger the river god; lest he/she suffered the consequences of banishment or even death. From a scientific perspective, the reverence given to the river as a god helped reduce unfriendly human activities on the river banks, which to a greater extent helped in preserving the river and its water resources. The influence of western religions and the increasing cost of living have had a grave effect on this belief system. Believers in western religions now disobey taboos without fear since they believe that such taboos are equivalent to occultism.

Interestingly, respondents of the Atankire and Sapelliga communities could not remember any taboo related to the management of the Atankire River (a tributary to the White Volta River) and the White Volta River respectively. One reason that could account for this observation is the gradual loss of indigenous knowledge probably due to urbanization and/or colonial influence. The big challenge still remains that customary means of transferring knowledge are disappearing since the older

generations get deceased without passing on their store of knowledge to the younger ones, (Langill, 1999).

5.2.2 Other Indigenous forms of Water Resources Management

Apart from taboos, other forms of water resources management were based on indigenous laws/practices which regulated human activities surrounding the river course. The main distinction between these indigenous laws and taboos is that, while taboos were strongly associated with superstitions and mystical consequences, indigenous laws were not bound by mysteries, but were rather guided by overall societal acceptance and sometimes community imposed fines. Defaulters were highly frowned upon by the community members. Farming along the river banks was traditionally not permitted in Pwalugu community during the rainy season. Only dry season farming was allowed, but at an estimated distance of between 30-50 meters away from the river banks. Whilst in the rainy season, farmers moved away from the banks to undertake upland cropping, thereby allowing the vegetation along the banks to regenerate. This practice has suffered a set back due to an increasing cost of living and the influx of the Fulani herdsmen into the community whose cattle cause a lot of havoc to upland crops far away from homes. Farmers now crop close to their homes and on the banks of the river where they can keep a watchful eye on their crops and at the same time maximize their crop yields from the rich soils deposited on the river banks.

Fishermen (Pwalugu and Sapelliga) in the past, made use of plant materials (the bark/leaves of the desert date; *Balanites aegyptiaca*) to weaken and capture fisheries resources in their fishing expeditions. This was done by pounding the leaves/bark of

the plant together with dawadawa leaves and either spread directly onto a pool of water or moulded into pellets after mixing with rice brand and used to bait fishes. The material was relatively harmless to humans but was effective in weakening fishes. The practice has since died out and has given way to the use of carbide, DDT and dynamites for fishing. Fingerlings which were always thrown back into the river after capture now find a great delight in market places. These developments can be attributed to the increasing cost of living and lack of alternative livelihood support opportunities as well as lack of awareness creation on sustainable environmental management.

Table 5.4: Traditional/indigenous laws in WRM in the study communities

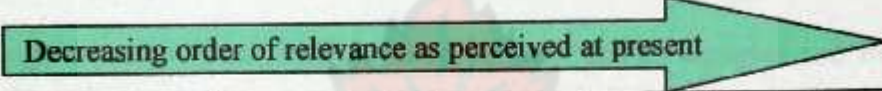
IFWRM	Customary or indigenous laws
Mognori	<ul style="list-style-type: none"> ▪ No logging or Farming close to river banks
Kugrasiab	<ul style="list-style-type: none"> ▪ Only dry season farming along banks; ▪ Use only pounded plant leaves and bark for fishing
Pwalugu	<ul style="list-style-type: none"> ▪ Use only pounded plant leaves and bark for fishing; ▪ Only dry season farming along banks
Atankire	<ul style="list-style-type: none"> ▪ No logging or Farming close to river banks
Sapelliga	<ul style="list-style-type: none"> ▪ Spear flower/grass planted on river bank as flood control mechanism; ▪ Use only pounded plant leaves and bark for fishing
Baazua	<ul style="list-style-type: none"> ▪ No logging or Farming close to river banks

The knowledge displayed by the community members during the focus group discussions regarding sustainable water resources management was so immense, yet they fail to implement such knowledge because they have to exploit the available resources to survive in these recent times of increasing cost of living. This gives a strong indication that local people understand and are most likely to get involved in practices that will protect water bodies if they are encouraged and supported either by governmental and/or non-governmental institutions with alternative livelihood

support programmes as well as given the necessary power/authority to enforce traditional rules where applicable.

Community members through focus group discussions and questionnaire administration were asked to rank in descending order which of the identified indigenous water resources management they would prefer to be brought back into full enforcement in order to ensure the sustainable management of their local water resources. The table below shows the outcome of the ranking exercise.

Table 5.5.: Communities ranking of preferred indigenous forms of WRM



Decreasing order of relevance as perceived at present

IFWRM	1	2	3	4
Mognori	Crocodiles hunt forbidden	No logging or Farming close to river banks	Forbidden to see the bottom of river	N/A
Kugrasiah	Only dry season farming along banks	No logging or farming around sacred grooves	Use of plant Extracts in fishing	Pour libation before cropping
Pwalugu	Only dry season farming along banks	No logging or farming around sacred grooves	Use of plant Extracts in fishing	Reverence to the river as a god
Atankire	No logging or Farming close to river banks	N/A	N/A	N/A
Sapelliga	No logging or Farming close to river banks	Only dry season farming along banks	Crocodiles hunt forbidden	N/A
Baazua	No bush burning	No logging of trees close to river	No weeding or cropping on river banks	No stealing along the river course

5.3 Suggested Strategies for the Incorporation of IFWRM into IWRM

Traditional water permitting systems were identified in Baazua and Kugrasiah communities which allowed traditional leaders to monitor activities around the White

Volta River. In the light of inadequate staff at the WVB, and for the sake of orderliness, traditional leaders can be authorized to keep records with regard to every activity in or along the river banks through the issuance of water permits to small scale and peasant farmers. This will help provide up to date information on water abstraction for an effective and efficient water resources planning as well as also help in improving state monitoring of water resources.

Majority of the White Volta Basin inhabitants are peasant farmers who live on the margins of survival. Without support from governments and /or other civil society organisations and groups, it was realised that indigenous communities have evolved coping strategies to extreme environmental conditions such as draughts and floods. These coping strategies as identified in the various study communities, to a large extent tend to be unsustainable (e.g. digging of the river bed to abstract water for irrigation and domestic purposes), since this is always done in the spirit of a life or death situation. In order therefore to promote sustainable resource management, alternative/sustainable livelihood support programmes are inevitable in the face of the increasingly unfriendly climatic conditions in the semi-arid Upper East Region of Ghana.

It was also identified that the end product of taboos in indigenous communities was the conservation of community's ecological resources. Through these taboos, community members in the study communities protected the White Volta River, sometimes without knowing it. Apart from taboos, community members made use of indigenous laws which were consciously meant to ensure sustainable utilization. Such indigenous laws now look more promising than taboos because of the influx of

modern religions (Christianity and Islam among others) and the continuous increase in scientific knowledge which tends to explain mysteries surrounding taboos. It is therefore necessary to make indigenous communities come to realise clearly their past efforts in WRM and the need for more cooperation and participation in WRM, in line with their past and present conservation efforts. A starting point could be the adoption and implementation of the first most preferred indigenous forms of water resources management as outlined in the ranking table (Table 5.5), which are mostly indigenous laws rather than taboos. A pilot project could be established by the WVBB secretariat in the six study communities and later expanded to cover the entire basin and beyond if successful.

Presently, none of the subcommittees (Appendix B) of the WVBB is clearly mandated to handle indigenous related management forms. Therefore the creation of a subcommittee of the White Volta Basin Board on indigenous water rights and management forms will go a long way to improve the representation of indigenous peoples and local community representatives in the decision-making body (WVBB), and will lead to more suitable water management approaches and equitable water allocation strategies. The created subcommittee will function best by actively integrating indigenous people from the White Volta basin communities and allowing them to participate and share experiences, knowledge and concerns, regarding their available local water resources. By so doing, sound practical indigenous forms of management can be absorbed into the operational framework of the White Volta Basin secretariat.

The Ghana Water Policy should be reviewed to include aspects of water resources management which seeks to access the potential of indigenous knowledge systems (IKS) throughout the country. This will go a long way to promote research in IKS as well as provide an enabling environment for community resources management and protection initiatives towards a more comprehensive integrated water resources management.

KNUST



CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

It was realised that members of the study communities are not well informed that ownership of water resources in Ghana is vested into the state and kept in custody by the President. Community members perceive water to belong to the traditional and spiritual authorities. This clearly indicates that the role of traditional authorities is very important in the domain of water rights and control.

A number of practices such as indigenous water permitting systems, coping strategies to droughts and floods, collaborations with other institutions among others have evolved over the years within the Study communities. Lessons and benefits from these practices if properly harnessed can facilitate community participation in projects and programmes towards the implementation of IWRM in the WVB.

Indigenous forms of WRM were identified in all communities visited and these were centred on the use of taboos and indigenous laws/practices. Indigenous management practices have been successfully used to manage inland water systems for thousands of years and it is time to recognize the value of indigenous perspective on water management, and from that perspective learn how to 'treat it right', thus preserving ~~our~~ water resources for future generations, (O'Bryan, 2007).

LIBRARY
KWAME NKRUMAH UNIVERSITY OF
SCIENCE AND TECHNOLOGY
KUMASI-GHANA

6.2 Recommendations

In order to improve upon local involvement in decision making, local management committees should be established in all basin communities. Leaders of such local committees can then be pooled into a bigger committee from which representatives can be selected to form part of the proposed indigenous water rights and management forms subcommittee of the WVBB. A schematic diagram of the proposed management system is shown in Appendix C.

Traditional authorities should be used to improve state monitoring of resources. For orderliness, traditional authorities should be assisted to design and implement water permitting and allocation mechanisms, making use of indigenous knowledge to safeguard the sustainable utilization of the White Volta River and its resources.

A survey should be conducted to cover the entire White Volta Basin in order to identify past and present forms of indigenous water resources management approaches in the entire basin. This will ensure a more integrated approach to the implementation of indigenous water resources management approaches towards a more comprehensive IWRM.

A Pilot project should be implemented in the six study communities on the first most preferred indigenous forms of water resources management outlined in the ranking table as a first step of incorporating indigenous forms of management into formal scientific methods. This can later be extended to other communities if successful.

REFERENCES

- Angassa A. and G. Oba (2007). Relating long-term rainfall variability to cattle population dynamics in communal rangelands and a government ranch in southern Ethiopia. *Agricultural Systems* 94 (2007). pp 715-725
- Bang-OA, E. (2003). Traditional Water Management Systems of the Kankanaeys of Besao. Indigenous Peoples' Contribution on the Occasion of 3rd World Water Forum 16-17 March 2003, Kyoto, Japan. pp 5-6
- Barry, B.; Obuobie, E.; Andreini, M.; Andah, W.; and M. Pluquet (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
- Birner, R., Schiffer, E., Asante, F., Gyasi, O. and McCarthy, N. (2005). Analysis of Governance Structures for Water Resources Management in the White Volta Basin Ghana. Report
- 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. pp 87-90
- Bruns, B. R. (2005). Community-based principles for negotiating water rights: some conjectures on assumptions and priorities. International workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', 26-28 January 2005, Johannesburg, South Africa. pp 2
- Bruns, B. R.; and Meinzen-Dick, R. S. (2000). Negotiating Water Rights in Contexts of Legal Pluralism: Priorities for Research and Action. In: B. R. Bruns and R. S. Meinzen-Dick (eds.), *Negotiating Water Right*. London, Intermediate Technology Publications. pp 23-55

- Cooney, R. (2003). The Precautionary Principle In Natural Resource Management And Biodiversity Conservation: Situation Analysis. The Precautionary Principle Project. IUCN, Traffic, Resource Africa. www.pprinciple.net [Accessed 12/11/2008]
- Cunningham, W. P. and Saigo, B. W. (1995). Environmental Science a Global Concern. 3rd Edition. W. C. Brown Publishers. Boston
- Emery, A.R. (1996). The Participation of Indigenous Peoples and Their Knowledge in Environmental Assessment and Development Planning (draft), in: Languil, S. 1999. Indigenous Knowledge: A Resource Kit for Sustainable Development Researchers in Dryland Africa. People, Land and Water Program Initiative, IDRC, Ottawa, Canada. Web site: <http://www.idrc.ca/plaw/11e-IK.html> [Accessed 23/08/2008]
- Ghana Statistical Service: 2000 Population and Housing Census, Special Report on Urban Localities, 2002. <http://www.citypopulation.de/Ghana.html> [Accessed 05/02/2008]
- Giesen, N. van de; Friesen, J.; Hafeez, M.; Liebe, J.; Andah, W.; Andreini, M.; Kunstmann, H.; Marx, A.; Burose, D.; and A.F. Moene, (2003). Strategic combinations of satellite and ground-based data for large scale hydrological monitoring: the Volta basin as a 400,000 km² observatory. International Workshop on Hydrology from Space, 2003-09-29/ 2003-10-01. Toulouse, France.
- IFAD, (1991). Water resources development, Upper East Region land conservation and smallholder rehabilitation project, Working paper 6.
- Johnson, M. (1992). Lore: Capturing Traditional Environmental Knowledge. IDRC: Ottawa, Canada. Web site: <http://www.idrc.ca/plaw/11e-IK.html> [Accessed 12/11/2008].
- Kunbuor, B. (2002). "Customary Law of the Dagara" of Northern Ghana: Indigenous Rules or a Social Construction. Journal of Dagaare Studies, Vol 2. pp 2

- Langill, S. (1999). *Indigenous Knowledge: A Resource Kit for Sustainable Development Researchers in Dryland Africa*. People, Land and Water Program Initiative, IDRC, Ottawa, Canada. Web site: <http://www.idrc.ca/plaw/11e-IK.html> [Accessed 12/11/2008].
- Lund, C. (2008). *Local Politics and the Dynamics of Property in Africa*. Cambridge University Press. USA. pp 47-67
- Malzbender, D.; Goldin, J.; Turton, A. and Earle, A. (2005). *Traditional Water Governance and South Africa's "National Water Act" – Tension or Cooperation?* International workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', 26-28 January 2005, Johannesburg, South Africa: pp 10
- Mdemu, M. V. (2008). *Water productivity in medium and small reservoirs in the Upper East Region (UER) of Ghana*. Ecology and Development Series No. 59, 2008. Bonn Germany. pp 10
- Min. of Local Govt., Rural Dev. & Environment & Moks Publications & Media Services, *A Public - Private Partnership Programme*, (2006). <http://www.ghanadistricts.com/region/?r=8&PHPSESSID=13a0eded63b10ed7341048d55ce51aff> [Accessed 19/12/2008]
- Ministry of Works and Housing (1998a). *Institutions and Participation*. Environmental Management Associates Ltd.: Accra. Report
- Ministry of Works and Housing. (1998b). *Regulation "Building Block" Study*. Nii Consulting Ltd.: Accra. Report
- MoWH, (1998). *Ghana Water Resources and Management (WARM) Study Report*.
- O'bryan, K. (2007). *Issues in Natural Resource Management – Inland Water Resources – Implications of Native Title and the Future of Indigenous Control and Management of Inland Waters*. Murdoch University *ELaw Journal*, Vol. 14, NO. 2 (2007): pp 180-181

- Odame-Ababio, K. (2003). Putting Integrated Water Resource Management into Practice – Ghana's Experience. Proceedings of the African Regional Workshop on Watershed Management, Nairobi, Kenya 8 – 10 October 2003: pp 157-166
- Odame-Ababio, K. (2002). The Changing Focus in the Development and Management of Ghana's Water Resources. Water Resources Commission of Ghana: Accra.
- Opoku-Agyeman, M. (2001). Shifting paradigms: towards the integration of customary practices into the environmental law and policy in Ghana. Paper presented by the Water Resources Commission at the Conference on Securing the Future organized by the Swedish Mining Association, 25 May – 1 June 2001 in Skellefteå, Sweden.
- Opoku-Ankomah, Y.; Dembélé, Y.; Ampomah, B. Y.; 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)
- PAGEV, (Undated). Training Module on Gender for PAGEV Project. Unpublished.
- Parotta, J. (2008). Traditional Knowledge of Forest management still essential. Presentation at the international conference on Traditional Forest Knowledge (TFK) and Sustainable Forest Management in Africa, 13-16 October 2008, Accra Ghana.
- Poolman, M. I. (2005). Developing small reservoirs, a participatory approach can help. Master thesis, Delft University of Technology. www.smallreservoirs.org/full/publications/reports/MasterThesis0705M-Poolman.pdf : pp 3
- Quansah, C. (2005). Oncho Transborder Project. Burkina Faso and Ghana. Natural Resources use and management report.

- Sarpong, G., (2004). Going Down the Drain? Customary Water Law and Legislative Onslaught in Ghana. This paper was commissioned by FAO under a joint FAO/IUCN research project investigating the interface of customary and statutory water rights, in progress.
- Sarpong, G. (Undated) Customary Water Law and Practices: Ghana. <http://www.fao.org/legal/advserv/FAOIUCNcs/Ghana.pdf> (accessed on 23rd June, 2008): 12pp
- Saveniji, H.H.G., and van der Zaag, (2000). Conceptual framework for the management of shared river basins with special reference to the SADC and EU. *Water Policy* 2 (1-2): pp 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, India, 5-11 August 2006.
- UN Doc, (2001). International Year of Freshwater, 2003. A/Res/55/196. <http://www.un.org/Depts/dhl/resguide/r55.htm> [Accessed 7/03/2009]
- UN Doc, (1993). Observance of World Day for Water. A/Res/47/193. <http://www.un.org/Depts/dhl/res/resa47.htm> [Accessed 7/03/2009]
- UN Doc, (2004). International Decade for Action, "Water for Life", 2005-2015. A RES/58/217. <http://www.un.org/Depts/dhl/resguide/r58.htm> [Accessed 7/03/2009]
- UNEP, (1999). Overview of land based sources and activities affecting the marine, coastal and fresh water environment in the West and Central African Region. UNEP Regional Seas Reports and Studies No. 171
- UNESCO, (2003). Third World Water Forum: Indigenous Peoples' Contribution on the Occasion of the 3rd World Water Forum 16-17 March 2003.

- http://portal.unesco.org/science/en/ev.php-URL_ID=3855&URL_DO=DO_TOPIC&URL_SECTION=201.html
[Accessed 7/03/2009]
- van Edig, A.; Engel, S.; Laube, W. (2003): Ghana's water institutions in the process of reforms: from the international to the local level, in: Neubert, S. et al. (eds.), *Reforming Institutions for Sustainable Water Management*. German Development Institute, Bonn: pp 40-42
- Van Koppen, B., Giordano, M., and Butterworth, J. (2007). *Community-based water law and Water Resources Management Reform in Developing Countries: Rationale, Contents and Key messages*. CAB International 2007: pp 2
- WALIR, (2002). *Water Law and Indigenous Rights. Towards structural recognition of local and indigenous rights and management rules in national legislation*. CEPAL-United Nations / Santiago de Chile & Wageningen University / Wageningen: 5pp
- World Bank, (1998). *Indigenous Knowledge for Development: A Framework for Action*. Knowledge and Learning Center, Africa Region, World Bank, November 4, 1998: pp 1
- Youkhana, Eva, Lautze, J. and B. Barry (2006). *Changing Interfaces in Volta Basin Water Management: Customary, National and Transboundary*. ZEF Working Paper Series, ISSN 1864-6638. Department of Political and Cultural Change, Center for Development Research, University of Bonn: 17pp
- Zwane, N., (2004). *The Role of Indigenous Knowledge Systems in the application of the Precautionary Principle in Environmental Resource Conservation*. A paper presented in the Global Biodiversity Forum 6/09/04 – 6/11/04, Dar-es-Salaam: 12pp

APPENDICES

Appendix A.: Composition of the White Volta Board

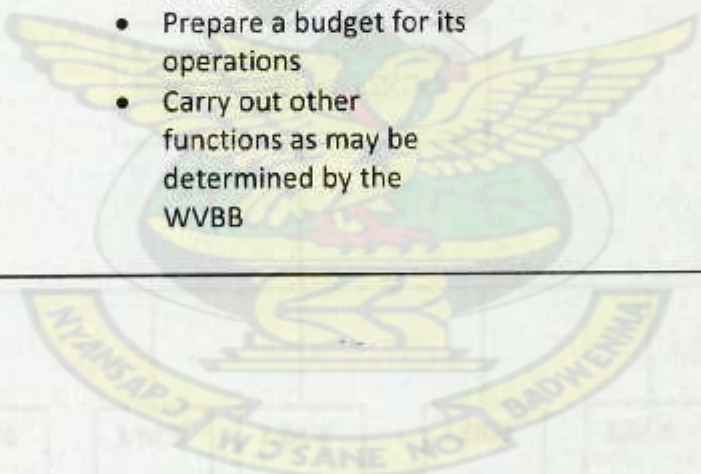
Sector/organisation		Representative	Number(s) represented
1	Water Resources Commission (WRC)	A Representative of the Commission (Chairperson)	1
2	Metropolitan/ Municipal/ District Assemblies	Bawku Municipal Assembly	1
3	"	Bawku – West District Assembly	1
4	"	Bolgatanga Municipal Assembly	1
5	"	Bongo District Assembly	1
6	"	Garu – Tempani District Assembly	1
7	"	Kasenna – Nankana District Assembly	1
8	"	Talensi - Nabdam District Assembly	1
9	"	West Mamprusi District Assembly	1
10	Regional Administration	Regional planning and coordinating unit of the Upper East Regional coordinating council	1
11	Water Users	Ministry of Food and Agriculture (MOFA)	1
12	Regulatory Institution	Environmental Protection Agency (EPA)	1
13	Research Institution	Savannah Agricultural Research Institute (SARI)	1
14	Non- Governmental Organizations (WRC)	NGO Forum on Water and Sanitation	1
15	Traditional Authorities	Upper East Regional House of Chiefs	1
16	Women's Representative	Department of Women (Ministry of Women's & Children's Affairs)	1
17	Water Providers	Community Water and Sanitation Agency (CWSA)	1

Appendix B.: Subcommittees of the White Volta Basin Board and their duties and membership

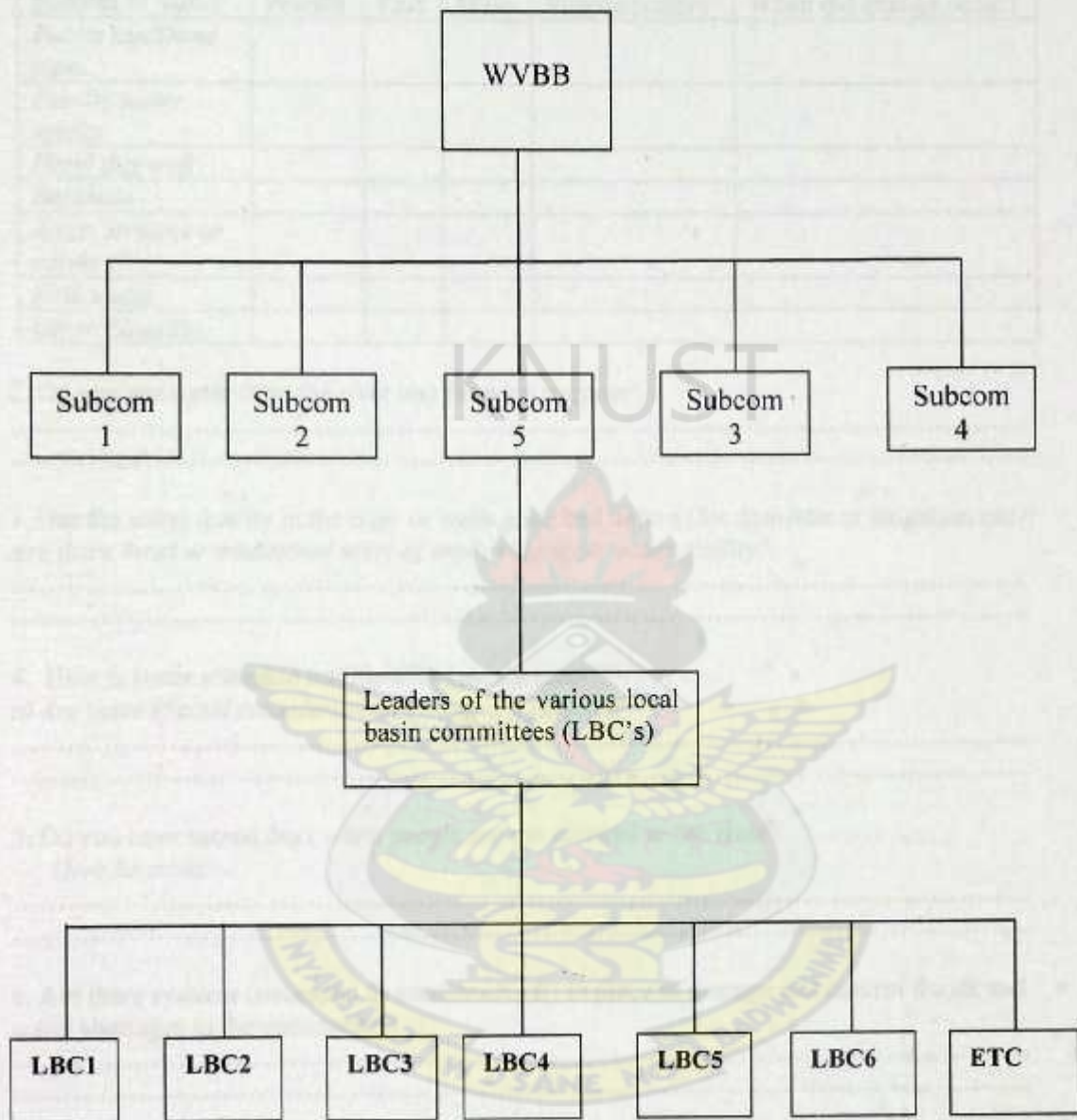
Subcommittee	Duties	Membership
1 Programmes and budget	<ul style="list-style-type: none"> • Draw up and facilitate the implementation of Programmes of activities for the WVBB • Collate the Budgets of other Committees • Prepare Budgets of the WVBB • Facilitate the sourcing of funds for the implementation of programmes • Carry out other functions as may be determined by the WVBB 	Abubakari Bolga Mun. Salifu Ziblim - MOFA Issaka Sagito - RCC Naaba Ayidana Asobayire III - RHC Amadu Abubakari Kaseha - Nankana
2 Landuse, research, education and public awareness	<ul style="list-style-type: none"> • Identify research needs of the Basin • Facilitate collaboration with relevant research institutions • Facilitate the education and public awareness programmes of the Board • Prepare a budget for its activities • Carry out other functions as may be determined by the WVBB 	Mathias Fosu - SARI Bukari Assimiga - Bawku-West K.N Crankson - N.G.O (RuralAid) Damma Mumuni - Bongo DA Aaron Aduna - WRC
3 Environment, utilization and regulation	<ul style="list-style-type: none"> • Facilitate the identification and registration of water users • Facilitate the licensing and granting of water use permits • Ensure compliance of all projects and water users, with water use and environmental regulations. • Carry out other functions 	Gilbert Amoah Ayamgah - CWSA Zenabu Wassai-King - EPA Salifu Ziblim - MOFA Salifu Yidana - West-Mamprusi Yin-Anab Mukasa Zoogah Talensi-Nabdam

as may be determined by the WVBB

4 Transboundary	<ul style="list-style-type: none"> Facilitate and maintain a strong collaboration between WVBB and other related Ghana – Burkina-Faso Transboundary institutions/structures Facilitate and maintain a strong collaboration between WVBB and the Nakambe Water Agency of Burkina Faso. Facilitate the implementation of pogrammes of the Ghana Country Committee of the Local Transboundary Committee. Prepare a budget for its operations Carry out other functions as may be determined by the WVBB 	David	Naa-Ire
		Puobenyerere - Municipal	Bawku
		Paulina Abayage - Dept of Women	
		Gaspard Tempani	Dery-Garu-
		Naaba Asobayire	Ayidana
		House of Chiefs	
		Issaka Sagito -Regional Coordinating Council	



Appendix C.: A Schematic Diagram of the Proposed Management of the WVB
 Depicting a Stronger Collaboration with Community Committees



Where:

WVBB – White Volta Basin Board

Subcom 1, 2, etc – existing subcommittees of the White Volta Basin Board

LBC – Local Basin Committee

Presently there are four subcommittees; the fifth subcommittee is a proposed recommendation to foster a closer collaboration with community members for the implementation of IWRM and also to help incorporate indigenous forms of WRM into formal scientific strategies.

Appendix D.: Research Questionnaire

1. Which are your most regular sources of domestic water?

Sources of Water	Present	Past	Main	Supplementary	When did change occur?
<i>Public tap/Stand pipe</i>					
<i>Private water vendor</i>					
<i>Hand dug well</i>					
<i>Borehole</i>					
<i>River, streams or ponds</i>					
<i>Rain water</i>					
<i>Other (Specify)</i>					

2. Do you use water from the river and for what purpose?

.....

3. Has the water quality in the river or wells gone bad before (for domestic or irrigation use)?
Are there local or traditional ways of improving upon water quality?

.....

4. How is water allocated traditionally (past/present)?
a) Are there special considerations during dry periods?

.....

5. Do you have sacred days when people are not allowed to the river?
Give Reasons:

.....

6. Are there systems (structural or non-structural) in place to manage and control floods and water shortages in the community?

.....

7. Is there collaboration between the community and government institutions to manage water resources? *What is the role of the community in this regard?*

.....

8. Do you have a water user group/ association or other associations whose members rely on the river for their livelihoods? Yes No

Group	Name of group	Activities	Initiated by:
A			
B			
C			

9. Have there been any conflicts regarding access to water?

Yes No

10. If the answer is "yes", specify the nature of conflicts:

- a) Domestic water use
- b) Irrigated agriculture
- c) Others

11. By whom are conflicts mainly resolved and how?

.....

12. What taboos or sayings concerning water and the resources of the river can you remember in this community?

.....

13. How effective are these taboos? Are they still enforced and do people obey?

.....

14. Which of these taboos do you think will still be relevant today?

.....

15. Apart from taboos, are there traditional laws that are used to protect the river?

.....

16. Are these laws effective and in your opinion, do you think they're still relevant today? Explain.

.....

17. In your own judgment, which of them (taboos & laws) will you prefer operational today.

Taboos / Laws	(Community Name)
1	
2	
3	
4	
etc	

18. What kind of farming is practiced along the White Volta River, Irrigated or rain fed?

19. *From where do you divert the water?*

- a) *Direct river diversion*
- b) *Reservoir/Dam*
- c) *Wells/boreholes*
- d) *Others*

20. How was dry season farming (irrigation) practiced in the past?
.....
.....

21. Who grants access to irrigation water?
.....

22. Who has access to the irrigation water?
.....

23. Who owns the water in the river? Explain.
.....
.....

24. Have you heard the name 'Water Resources Commission' before?

25. Do you know what the WRC does? Explain.

26. In your opinion who do you know or think owns all water resources in Ghana?

- a) Traditional authorities
- b) Government
- c) WRC
- d) Others

27. Who will you prefer to be in charge of water allocation, Government (WRC) or traditional rulers? Explain

28. Are there any problems in the community regarding the management of water in the river?
.....
.....
.....