THE USAGE AND MANAGEMENT OF TRANSBOUNDARY RIVER RESOURCES FOR SUSTAINABLE LIVELIHOOD IN THE BAWKU AREA

BY

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DECLARATION

I, Asaah Sumaila Mohammed (ID: 10235192), the author of this thesis titled, "*The Usage and Management of Transboundary River Resources for Sustainable Livelihood in the Bawku Area*" do hereby declare that except for references to other peoples' work, which have been acknowledged and cited, this work is the sole result of my personal effort under the supervision of Prof. Steve Tonah and Dr. Stephen Ayidiya of the University of Ghana. I further declare that this work herein submission has never been presented for any other degree elsewhere.

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DEDICATION

I sincerely dedicate this work to my parents Mr. Mohammed Asaah and Mrs. Hawa Mohammed and also to my siblings especially Abeo Ayingura for their moral and financial support to the attainment of my higher education.

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ABSTRACT

Water is essential to almost all human activities including agriculture, domestic use and industry and among others. This study has therefore assessed the usage and management of the White Volta River in the Bawku area for livelihood. The study used cross-sectional data collected from households, river users groups, Government and Civil Society Organisations in three riparian communities of the White Volta in the Bawku area. The data was analyzed using statistical packages such as the SPSS and MINITAB. The results have been presented in tables to suit the objectives of the study.

The study results show that riparian communities in the Bawku area mainly use the White Volta resources for several livelihood activities such as rainy season cropping, dry season gardening, livestock rearing, fishing and river transportation, and sand winning and bricks molding. High crop yield along the River was found to be associated with the River's resources which provides ideal condition for improved rainy season cropping and dry season gardening. Large scale production of livestock in the communities was found to be associated with river resources which provide abundant water and pasture for livestock rearing. The all-year-round flowing of the River due largely to the construction of the Bagre Dam in Burkina Faso has not only improved dry season gardening and livestock rearing but has also made it possible for river transportation in some of the riparian communities. The construction of the Dam has however affected fishing which is traditionally undertaken in stable waters whenever the River dries up.

Several factors such as flooding, destruction of farms by animals and drying up of some parts of the River are some challenges to effective utilisation of the River for livelihood in the riparian communities. Concerns have been raised that the nature of some of the livelihood activities such as cropping very close to the River and over grazing by animals lead to erosion and siltation which affect the flow of the River.

For the management of the River, study has found that customary beliefs and practices are being used for preserving the River resources at the communities' level. It was however found that these customary practices are losing their usefulness due to modern religious beliefs and practices. Nevertheless, national and international organisation as well as civil society interest was found to be growing towards the management and preservation of the White Volta. The GLOWA Volta Project and the IUCN are working in collaboration with national institutions such as the WRC to implement Projects for improving water governance and preserving the ecosystem of the Basin.

The study concludes that the sustenance of the River is crucial for the development of the riparian communities. Integrated river resources planning and management with much participation of the local communities, Government and Civil Society Organisations is therefore recommended for efficient utilisation and management of the River resources in the riparian communities.

TABLE OF CONTENT

CHAPTER TWO

LITERATURE REVIEW

CHAPTER THREE

RESEARCH METHODS

LIST OF TABLES

CONTENT **PAGE**

LIST OF FIGURES

LIST OF APPENDICES

CONTENT

PAGE

LIST OF ABBREVIATIONS

ANBO	African Network of River Basin Organisation
AWI	African Water Initiative
BISACOPOU	Bisa People Union for Development
CIDA	Canadian International Development Agency
DANIDA	Danish Development Agency
DGH	General Directorate of Hydraulics
DGIRH	General Directorate for Inventory of Hydraulic Resources
EU	European Union
FAO	Food and Agriculture Organisation
FSD	Forest Service Division
GEF	Global Environment Facility
GLOWA	Research Project on River Basin Hydrology and Management
GSS	Ghana Statistical Services
GTZ	Gesellschaft für technische Zusammenarbeit (German Organization for Technical Cooperation)
GWP	Global Water Partnership
GI	Greenpeace International
GPRS	Ghana Poverty Reduction Strategy
GVP	GLOWA Volta Project
IFAD	International Fund for Agricultural Development
IWRM	Integrated Water Resources Management
IUCN	International Union for the Conservation of Nature
IWMI	International Water Management Institute

JICA	Japan International Cooperation Agency
LACOSREP	Upper East Region Land Conservation and Smallholder Project
MOFA	Ministry of Food and Agriculture
NADMO	National Disaster Management Organisation
NGO	Non-Governmental Organisation
PAGEV	Projet d' Ame'lioration de la Gouvernance de l' Eau dans le basin de la Volta/Project for Improving Water Governance in the Volta Basin
SPSS	Statistical Package for Social Sciences
SIDA	Swedish International Development Agency
SRL	Sustainable Rural Livelihood
UN	United Nations
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
VBA	Volta Basin Authority
VIP	Village Infrastructure Project
WATEC	Technical Advisory Committee for West Africa
WB	World Bank
WARM	Water Resources Management
WHO	World Health Organisation
WRC	Water Resources Commission
ZEF	Center for Development Research, University of Bonn, Germany
ZOVFA	Zuuri Organic Farmers Association

CHAPTER ONE

BACKGROUND TO THE STUDY

1.1 Introduction

Water is essential to almost all human activities including agriculture, domestic and industrial use among others (Crippen & Pavelka, 1970). This statement reinforces the crucial role water plays in the livelihoods of individuals, families, communities, regions and nations.

Globally, there is strong evidence that communities located along river basins are renowned for better socio-economic development. Their proximity to rivers guarantees rich soils, abundant water supply for irrigation, fishing and transportation (Global Water Partnership, 2004).

Ancient and modern communities alike have depended on rivers such as the Tigris, the Euphrates, the Nile, the Niger, and the Zambezi for livelihood, commerce and the production of goods and services. The earliest evidence of river engineering is the ruins of irrigation canals of over eight thousand years old in Mesopotamia. Other remains of water storage dams found in Jordan, Egypt and other parts of the Middle East date to at least 3000 BC (World Commission on Dams, 2000).

In modern times, sustainable socio-economic progress is seldom possible without adequate development of water resources to support food production, industry, the environment and other human needs. Basin Water is one of the most important resources with great implication for African development (Africa Water Journal, 2003). There are about 59 transboundary rivers occupying about 80% of the continent's surface water resources. The management of these resources is crucial for reducing the continent's long standing poverty (IUCN, 2004). In the Volta River Basin for instance, the survival of the over fifty ethnic groups from Ghana, Burkina Faso, Mali, Cote d' Ivoire, Benin and Togo is based largely on the Basin's resources (Buah, 1998; Oxfam, 2000; FAO, 2001; Challenge Programme for Water and Food, 2003).

In parts of the Volta Basin in Ghana, riparian communities are engaged in both rain-fed and irrigated agriculture, livestock production, fishing and river transportation (Gordon & Amatekpor, 1999). In the Yeji area of the middle Volta basin for instance, irrigation, livestock rearing and river transportation are the main livelihood activities of the inhabitants (Tonah, 2001). In Burkina Faso the damming of the Nakembe (White Volta) at Zabre and Bagre has intensified irrigation and livestock rearing among the riparian communities. Meanwhile, in parts of the lower Volta Basin, particularly in Mepe and Sokpoe, the construction of the Akosombo dam profoundly affected the sources of livelihood of the riparian communities. Food crop farming and fishing have been in a state of crisis in the Lower Volta area since the construction of the dam (Tsikata, 2005).

However, the availability of freshwater in many rivers in Africa is coming under threat in contemporary times. In the Volta Basin for instance, water shortage is the prime limiting factor for communities' optimum use of the Basin's resources (Gordon & Amatekpor, 1999). Since water is becoming a scarce resource in the area, access to water has become a recipe for conflict between the various user groups and also between Ghana and Burkina Faso, who together share 85% of the total basin area (GLOWA Volta, 2002; Curtin & Charrier, 2004; Tonah, 2001).

The IUCN (2004) states that since the construction of the Bagré dam in Burkina Faso in 1993, small irrigated areas have been developed along the river banks of the Nakambe (White Volta). However, these irrigation practices are inefficient and unregulated thereby posing threats to the sustainable use of the river for livelihood. The situation may get worse as a result of population growth, rapid urbanization, increasing agriculture and industrial activities, and lack of adequate capacity to manage freshwater resources (IUCN, 2004).

From the above, enhancing water security and productivity at both the household and community level is a growing challenge in the Volta River Basin. Concerns have therefore been raised that the misuse of this precious resource may be the prime limiting factor for future development, especially in the Bawku area where alternative livelihood sources are limited (IUCN, 2004). Current development priorities, including household food security and health, poverty alleviation through agricultural and economic growth, and environmental sustainability will be achieved only if adequate water is available for each of these objectives (Gordon &

Amatekpor, 1999; GLOWA Volta, 2002). Yet, these priorities often compete for increasingly scarce water resources stemming from demands of rapid urban growth, bad farming practices leading to river siltation, combined with large electricity demands from hydropower generation and increasing industrialization. This negatively impinges on rural water consumption and health, irrigated agriculture, and the maintenance of ecological stability (Ministry of Works and Housing, 1998b; World Bank, 1995; Gordon & Amatekpor, 1999).

Therefore, efficient (re)use of this liquid resource requires the participation of government, civil society organisations and local communities in integrated water resources management for sustainable livelihood (GLOWA Volta, 2002).

1.2 Problem Statement

Historically, communities in the Bawku area of the White Volta basin have been using the resources of the White Volta River for various activities. National and international interest is nevertheless growing in the basin-wide Integrated Water Resources Management (IWRM) for sustainable livelihood in the riparian communities. In the Bawku area for instance, government and non governmental organisations such as the Ghana Water Resources Commission, International Union for the Conservation of Nature (IUCN), among others are intervening in the management of the river's resources.

Whilst the intervention of these organisations require adequate knowledge of the types and nature of livelihood activities taking place along the River, very little

documentation has been made to that effect. Rather several researches such as the Global Environment Facility (2002b), the Challenge Programme for Water and Food (2003), the Water Resources Commission (2004) and the IUCN (2004) have only assessed the water resources endowments and shortages in the riparian communities and the threat on the sustenance of the River by the ongoing human activities both at the community level in Ghana and Burkina Faso. Whilst these researches are very invaluable in their analysis of the hydrologic conditions in the watershed, their assessment of how communities utilize and manage the resources of the basin for their livelihood is limited if not lacking. In-depth studies on the allocation of River resources and management systems at the local community's level are limited if not lacking. More so, the activities of government and non governmental organizations in the management of the White Volta River have not been comprehensively documented.

This study is, therefore, designed to assess the various livelihood activities in the riparian communities and the way activities impact on the sustenance of the River. The study also intends to assess local systems of managing the White Volta River and the contributions of government and civil society organisations in the management of the River's resources.

It is envisaged that the outcome of this study will provide information for designing a comprehensive strategy for utilizing and preserving the White Volta for sustainable livelihoods in the Bawku area.

1.3 Research Questions

1. What types of livelihood activities exist in the communities along the White Volta and how do these livelihood activities enhance the wellbeing of the riparian communities?
2. How do the livelihood activities impact on the sustenance of the River?
3. How are the local communities managing the resources of the River?
4. What are the contributions of Government and Civil Society Organisations to the management of the White Volta in the area?

1.4 Research Objectives

1.4.1 Main Objective

The main objective of the study is to assess the usage and management of the White Volta for sustainable livelihood in the Bawku Area.

1.4.2 Specific Objectives

The study specifically seeks to:

1. identify the various livelihood activities in the communities along the White Volta and how they enhance the wellbeing of the riparian communities;
2. to assess how the local communities are managing the resources of the River;
3. assess the contributions of Government and Civil Society Organisations in the management of the White Volta in the area.

1.5 Definition of Key Concepts

For the purpose of this research, the following key concepts will be defined as follows

- Livelihood: Activities on which individuals or groups of people depend for their living.
- Transboundary Rivers: Shared river basins along and or across international boundaries.
- River Water Management: Judicious and economic utilisation of river water and its related resources that ensures sustainability.
- Riparian Communities: Communities Living along River Basins

1.6 Significance of the Research

The significance of any academic work that is research-oriented has been established by Marshall and Rossman (1995) in three key areas: the linkage of the study to larger practical and theoretical problems; concerns of practice; and social policy issues. This study is therefore relevant in the following ways:

1. In the quest to finding lasting solutions to poverty among communities in the Bawku area, a research such as this provides information on the potential of the White Volta for development policy planning and revision of existing development programmes.

2. The findings of this research will be relevant to government, policy makers and civil society organisations in the formulation of sound rural development strategies for the preservation of the White Volta resources.

3. The study will provide broader lessons applicable to other communities in the entire Volta Basin. It will provide the basis for similar researches to be conducted in other riparian communities of the Volta basin. It will strengthen research partnerships, a synthesis of case studies and specific recommendations for including indigenous approaches to development in the Volta basin.

1.7 Outline of the Study

The study is organized in six chapters. **Chapter one** is the background of the study. This chapter gives a historical antecedent of how communities located near rivers have become prominent via the use of river resources for their livelihood. This chapter also looks at water shortages in the Volta basin in particular as a threat to livelihood in riparian communities. Chapter one also contains the statement of the problem. This section traces the genesis of the problem by identifying knowledge gaps in previous researches conducted in the study area so as to justify the current research. The problem statement is followed by the research questions and research objectives. The chapter also outlines the significance of the study to policies and programmes on rural poverty reduction and also to the academia as sources of information for subsequent researches.

Chapter two contains a review of relevant literature on river resources utilization and management. The following themes have formed the basis for the literature review; Livelihood Activities in River Basins, Fresh Water Crisis and its Effects on Livelihood Activities in the Volta Basin, Fresh Water Crisis as source of Conflicts in the Volta Basin, Community Level Management of River Resources, and Contributions of Government and Civil Society Organisations in the Management of River Resources.

Chapter three contains information on the methodological design for the collection of comprehensive data. The first section of this chapter provides a broader description of the study area taking into consideration its size, location and the socio-economic features. Another important area discussed in this chapter is the research methods. This section begins with the sampling procedure used in determining the population for the study. The chapter also contains the data collection tools. The process of data analysis and discussions also form part of this chapter.

Chapter four looks at the various types of livelihood activities along the River and how these activities enhance the wellbeing of the riparian communities. The Analysis of data is based on the information obtained from questionnaires, interviews with Government and Civil Society Organisations, community forums and focus group discussions with the River resources users. The analysis is well presented in tables, frequency counts and others.

Chapter five examines the management of the River at the community level and the contributions of Government as well as Civil Society Organisations in the management of the White Volta River Resources in the communities. This chapter also includes content analysis of data collected from government agencies and Civil Society Organisations.

Chapter six gives a summary of the major findings of the research and draws conclusions from the study by giving the way forward for efficient and sustainable utilisation of the White Volta and the entire Volta basin. The chapter gives recommendations for efficient usage of the White Volta for livelihood and appropriate strategies for effective management of the resource.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section has reviewed literature on the utilisation and management of transboundary rivers for sustainable livelihoods. The chapter has specifically reviewed literature on the following:

1. Livelihood activities in transboundary river basins;
2. Fresh water crisis and its effects on livelihood activities in the Volta Basin;
3. Fresh water crisis as a source of conflicts in river basins;
4. Community level management of river resources;
5. Government and civil society contributions to management of river resources.

2.2 Livelihood Activities in Transboundary River Basins

River basins are renowned as the cradles of civilization and cultural heritage (Global Water Partnership, 2004). Historically, flood plains have been preferred places for human settlement and socio-economic development because their proximity to rivers guarantees rich soils, abundant water supplies and means of transport. Also, flood plains replenish wetlands, recharge groundwater and support fisheries and agriculture systems (Global Water Partnership, 2004).

Ancient and modern communities alike have depended on rivers for livelihood, commerce and production of goods and services. Remains of water storage dams found in Jordan, Egypt and other parts of the Middle East date to at least 3000 BC. Dams and aqueducts built by the Romans to supply drinking water and sewer systems for towns still exist today (World Commission on Dams, 2000).

In contemporary times many nations and communities use river resources for many activities, mainly for livelihood. According to the African Water Initiative (AWI, 2002), over 20 million people in Central Africa depend on the resources of the Lake Chad for irrigation and pastoralism which constitute to their livelihood, and this figure is expected to increase to 35 million by 2020. The AWI (2002) also found that the Zambezi river and its basin is home to over 38 million people who are engaged in a wide range of uses from agriculture and livestock grazing, to provision of freshwater and fish - the river further supports millions of livelihoods directly and indirectly across Southern Africa.

In the Nile River, local communities fish and navigate its waters. Ferries and barges navigate between Aswān and Qinā in Egypt, between the third and fourth cataracts in northern Sudan, from Juba to Kūstī in southern Sudan, and on Lakes Nasser and Victoria. Principal river ports are Luxor and Aswān in Egypt and Wādīalfā', Dunqulah, Kuraymah, Kūstī, Malakāl and Juba in Sudan. Tourism is important around ancient Egyptian sites near the river, such as Al Karnak and the pyramids at Giza.

In the Volta River Basin, the survival of the over fifty ethnic groups from Ghana, Burkina Faso, Mali, Cote d' Ivoire, Benin and Togo is based largely on the Basin's resources (Buah, 1998; Oxfam, 2000; FAO, 2001; Challenge Programme for Water and Food, 2003). In parts of the Basin in Ghana, riparian communities are engaged in both rain-fed and irrigated agriculture, livestock production, fishing and river transportation (Gordon & Amatekpor, 1999). In the Yeji area of the middle Volta basin for instance, irrigation, livestock rearing and river transportation are the main livelihood activities of the inhabitants (Tonah, 2001).

Titriku (1999) notes that agriculture is the principal industry within the Volta Basin and its practice follows the general pattern of agricultural land use in Ghana. Agricultural activities within the Basin fall under four major land use or land utilisation types namely; rain-fed agriculture, irrigated agriculture, livestock rearing and fishing. Titriku (1999) further observed that the Basin has a high potential for the production of food crops and livestock in Ghana and Burkina Faso.

In the Lower Volta basin comprising parts of the Ho-Keta Plains, Titriku (1999) asserted that livestock rearing constitute a very important agricultural activity. Agriculture production in the area, however, has peculiar problems mostly relating to land degradation and general production constraints. In spite of the vast areas in the Basin suitable for irrigated agriculture, there are only a few schemes dotted along the lake especially in Ghana (Titriku, 1999). In Burkina Faso, however, research has shown that the irrigation potentials of the Basin have been fairly exploited. About

1500 small and large dams have been constructed at various locations in the Basin in Burkina Faso (IUCN, 2004).

In Burkina Faso the damming of the Nakembe (White Volta) at Zabre and Bagre has intensified irrigation and livestock rearing among the riparian communities (IUCN, 2004). Meanwhile, in the lower Volta basin particularly at Mepe and Sokpoe, the construction of the Akosombo dam profoundly affected the sources of livelihood of the riparian communities (Tsikata, 2005). Food crop farming and fishing have been in a state of crisis in the Lower Volta area since the construction of the dam. The cessation of the floods of the Volta River meant that patterns of livelihoods constructed around the cycle of seasonal flooding were compromised. Fishing in the main river, which in the pre-dam period was a major subsistence activity, went into decline soon after a post-dam boom (Tsikata, 2005). Indeed, some of these impacts are common to downstream communities of large dams the world over (McCully, 1996).

According to MOFA, (2008) the Upper East Regional Directorate in 2007 has designed a strategy for cropping three times along the White Volta River. The strategy involves growing maize and sorghum as third crops per year by pumping water from the White Volta for irrigation. In a prior field trial conducted in 2005, the average yield was 3.7 tons per hectare, compared to a national average of 2.5 tons and a regional average of less than 1.2 tons. Irrigation is certainly a major factor for this yield difference. For instance, the net benefit from maize was 400 Ghana Cedis per hectare. While this return is lower than that of vegetable gardening, one has to

consider that this is an additional income, to be added to the income from rain-fed crops (MOFA, 2008).

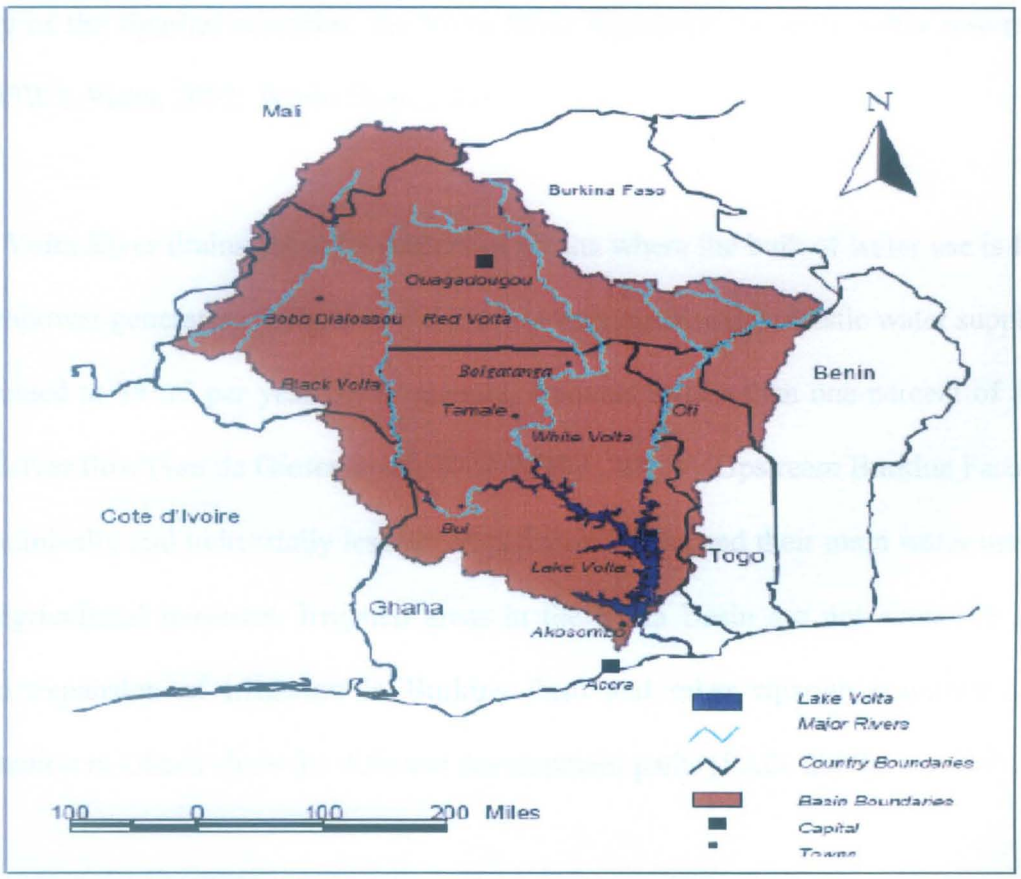
Despite the fact that livelihoods activities are flourishing in many parts of the basin, some of the activities turn to pose threats to the sustainability of the River. The IUCN (2004) and Water Resources Commission of Ghana (2004) noted that irrigation practices along the basin are very inefficient and tend to accelerate erosion and sedimentation in many parts of the River and flood plains. Increased erosion and sedimentation reduce infiltration and the flow of the River. This coupled with competition for scarce water and land may contribute to increased poverty and insecurity in the area.

2.3 Fresh Water Crisis and its Effects on Livelihood Activities in the Volta Basin

Water is identified as one of the most important natural resources because it is viewed as a key to prosperity and wealth (Arbués *et al.*, 2003). However, water tables are falling and aquifer depletion is now an emerging problem (Brown, 2001). Rockström (2001) reported that natural factors as well as human actions and inactions are directly responsible for water scarcity problems. Human activities may alter the hydrological cycle in uncertain ways resulting in greenhouse-induced climate changes. Rockström (2001) further explained that population growth, directly or indirectly, is expected to shift about 55% of the World's population towards water stress or severe water scarcity over the next generation.

The Volta River basin is characterized by unpredictable rainfall patterns with periodic and perennial water shortages. The Basin is one of the poorest watershed areas of Africa and the ninth largest river basin in sub-Saharan Africa, traversing six riparian countries, namely, Ghana, Togo, Burkina Faso, Côte d'Ivoire, Benin and Mali. However, Ghana and Burkina Faso alone share about 85% of the entire basin (WARM 1998; GEF 2002; World Bank, 2001). The map in Figure 2.1 shows the Volta Basin.

Figure 2.1: Map of the Volta Basin



Source: From the GLOWA-Volta project (2003): http://www.glowa-volta.de

The basin is under high demographic pressure, with a population growth rate estimated at approximately three percent per year and the total basin population currently estimated at approximately 18.6 million people (WARM 1998; GEF 2002a). The World Bank (2001) stated that extremely low incomes of much of the population result in overexploitation of the natural resources of the Basin, which seriously affect the sustainable development of the region.

Increasing population within the Basin has increased freshwater demand for human consumption, industrial and agricultural production and the generation of hydropower. With few other natural resources available, rain–fed and some irrigated agriculture is the principal basis of development for the people of the Basin. For many of the riparian countries, the Volta River represents the main water resource (GLOWA Volta, 2002; World Bank, 2001).

The Volta River drains about 64 percent of Ghana where the bulk of water use is for hydropower generation. Irrigation water use is very small and domestic water supply, estimated at 35 m^3 per year per household, amounts to less than one percent of the total river flow (van de Giesen *et al*., 2002; WHO, 2000b). Upstream Burkina Faso is economically and industrially less developed than Ghana and their main water use is for agricultural purposes. Irrigated areas in the Volta Basin are not extensive but rapid expansion of irrigation in Burkina Faso and other riparian countries and stagnation in Ghana show the different development paths (FAO, 2000).

In Burkina Faso for instance, most irrigation development takes the form of village-level schemes with imperfect hydraulic control. Over a thousand village dams were

built in the whole of Burkina Faso in 1991, mainly for cattle and drinking water purposes (Sally, 1997). Presently, many dams are built or converted to function as reservoirs for irrigation water in Burkina Faso (FAO, 2000). This is a potential source of acute conflict as Ghana rejects any plans that will reduce the volume of water reaching the Akosombo dam on which it depends for almost all the energy needs. Low water levels in the dam in 1998 caused a major energy crisis in Ghana, which Ghana attributed to Burkina Faso's water development schemes (Green Cross, 2001). The total potential irrigable area of these two major riparian countries is approximately 1.5 million hectares but only 52,400 hectares have been developed which forms three percent of the potential (FAO, 1997; WARM, 1998). This implies that any expansion in irrigation may pose more threat to the river if regulatory measures are not put in place.

The quantities of water needed for domestic and industrial activities, irrigation, and livestock production activities are projected to increase to about 300 percent due to the rapid population increase and expected industrial expansion, both of which will require an increased use of water (World Bank, 2000; Green Cross, 2001). The water demand data for irrigation in the basin in Ghana and Benin are projected to increase 538 percent and 706 percent respectively (WARM 1998; GEF 2003a). The high projections of water demand for irrigation in the basin stem from the fact that rain-fed agriculture is becoming more precarious and less reliable under climate change and the ensuing variable precipitation. Further, the need to produce adequate food to feed the rising populations is a major concern of the countries in the sub-region (World Bank, 2001).

The FAO (1997) estimates that the current total Basin annual irrigation water requirement is 28.5 km³. However, access to water resource remains highly skewed in the Basin. Although the River has a great development potential, presently the main water use is limited to hydroelectric power generation. Ninety-seven percent of water use in the Basin is for hydropower generation, two percent for irrigation purposes and one percent for domestic and industrial uses (WARM, 1998; GEF, 2002a).

Throughout the Volta River Basin, dams and reservoirs have been created in order to mobilize water for agricultural, industrial, and electricity-generating purposes. The number of these large and small dams continues to expand as population pressure grows. Increasing use of the water resource and decreasing precipitation in the region, however, threaten continued sustainable management of the waters in the Basin. Appropriate legal framework for coordination and cooperation between the riparian countries are therefore necessary (GLOWA Volta, 2002).

The watershed of the Volta River is one of the poorest areas of Africa. Despite the presence of some precious mineral resources, average annual income is estimated in the region at US $800 per year. For the majority of the population, rain-fed and some irrigated agriculture is the backbone in the largely rural societies and the principal source of income. Population growth rates exceed 3%, thereby increasing pressure on land and water resources (GLOWA Volta, 2002).

The GLOWA Volta (2002) reported that improved agricultural production in the West African savannah depends on the development of (near) surface water resources and their effective use. The report further noted that such water development programs will have an impact on the availability of downstream water resources, in particular on those of the Volta Reservoir on which the urban population of Ghana depends for power generation (GLOWA Volta, 2002).

2.4 Fresh Water Crisis as source of Conflicts in the Volta Basin

Global water crisis has resulted in increased competition for water, even to the point of conflict among the various users. In Kenya for instance, competition for water for various activities has resulted into conflicts among users. Villagers need water to meet their domestic needs, pastoralists are constantly in search of grazing land and water for their livestock and smallholders (agriculturalists) need water to grow their crops. All these parties compete for available supplies and, in most cases, not doing much to conserve the resource for continued sustainable use (Rogers *et al.*, 1998). Having legislation and regulations over water use is not an adequate solution. There is the need for local institutions that have the capacity to resolve these water conflicts (Rogers *et al.*, 1998).

In the Volta Basin, water is becoming a scarce resource; access to water is becoming an important potential conflict. In 2002, Green Cross International identified the Volta basin as potentially conflictive (Curtin and Charrier, 2004) and despite this fact, institutional analysis of the capacities of conflict management structures at the local level are lacking in the area. Competition over water and land and related

resources could become a source of tension and even conflict, especially between Ghana and Burkina Faso, which together share 85% of the total Basin area (GLOWA, 2002).

Agricultural sector water requirements could also increase considerably in the future. Burkina Faso, Ivory Coast and Mali are three of six West African countries that presently irrigate only a little over 10 % of their irrigable land area. The possible expansion of irrigated areas will certainly have consequences for water use in the Volta Basin (GLOWA, 2002). On the other hand, the vital nature of fresh water could also be a powerful incentive for cooperation and benefit sharing for many communities whose livelihoods depend largely on the River resources (IWRM/IUCN, 2004).

Despite the construction of major hydraulic works with considerable international implications beginning in the 1960s, it appears that transboundary issues began to constitute a major concern in the Volta Basin only in the mid-1990. It was at this point that the World Bank took a more active role in the water affairs of Ghana and Burkina Faso and invoked waters policy whereby a country proposing to execute any project which will regulate, abstract or otherwise change river flows must notify co-riparian states of its intentions so that each state may consider whether it wishes to lodge an objection" (Ministry of Works and Housing, 1998b; World Bank, 2000).

Interest in transboundary management of the Volta, nevertheless, re-intensified when reduced water levels at the Akosombo dam led to an energy crisis in Ghana in 1998.

Although the energy shortage was due largely to a drought similar to those which had created energy shortages previously, Burkina Faso's water consumption was suspected to be the main cause of reduced water levels at the Akosombo dam. In response, Ghana offered to supply Burkina Faso with energy in order to prevent the country from building the dams on a Volta tributary, which was expected to considerably reduce water flow in the Volta. Burkina Faso rejected these plans, insisting on an autonomous national energy supply. Notions of national sovereignty and fears of flooding in northern Ghana caused by sudden water releases from dams in Burkina Faso are major concerns for Ghanaian water management (van Edig *et al.*, 2001; Barry *et al.*, 2004). Subsequent research (clearly shows that Burkinabe water withdrawal had little to do with reduced flow in Ghana, the need for some degree of cooperation and information exchange has become evident (Andreini *et al.*, 2000). There is the need to remedy this deficiency through a historical examination of water management structures in the Ghanaian and Burkinabe portions of the Volta Basin in order to draw some general patterns.

2.5 Management of River Resources for Sustainable Livelihood

In contemporary times, river basin management has been proven to be a tool for community development, poverty reduction and peace building (Rahaman and Varis, 2005). Basin water management is not an end to itself, but a means to eradicate poverty, guarantee basic human rights to all and preserve the natural resource base for future generations (UN Water/Africa, 2003). The primary objective of river water management is to contribute to the transformation of society towards social and environmental justice. This will serve as an impetus for the realization of the Africa

water vision for 2025 - *an Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation and the environment* (UN Water/Africa, 2003).

Micro-irrigation technologies, commonly in use in water scarce areas of developed countries, constitute one such intervention with the ability to use water more efficiently in irrigated agriculture. These technologies can improve productivity; raise incomes through crop yields and outputs; and enhance food security of households. Numerous studies have established the gains from micro-irrigation adoption and several government and non-governmental organizations are engaged actively in promoting the technologies (Shah and Keller, 2002; IWMI, 2006).

In India, micro-irrigation technologies have been marked for more than three decades. The main vehicle of government policies to promote micro-irrigation systems are products subsides – in certain cases up to 90%. However, there has been lukewarm response to such initiatives from farmers, especially smallholders. This according to IWMI (2006) can be attributed to several causes; lack of access to groundwater, lack of cash, crop specificity of the available micro-irrigation technologies, poor product quality and absence of adequate credit facilities. Studies show that despite active promotion, the appeal of these technologies has remained confined to "gentlemen farmers" – wealthier farmers who produce commercial crops (Shah and Keller, 2002; IWMI, 2006).

In Kenya, small-scale drip irrigation technology is predominantly being practiced among large scale farmers. Small-holder farmers have low access to drip irrigation because of its high cost of operation. Some international firms have developed an approach to small-scale, low-head drip irrigation via the use of kits. Local entrepreneurs have shown an interest in providing drip irrigation kits from locally available material, including drip tape that is manufactured in Kenya. This means that kits will be readily available at affordable prices (Herbert, 2002).

A new improvement in the drip system is the introduction of the bucket system and the subsequent drum system both aimed at improving the livelihood of the small-holder through gardening. Small-scale drip irrigation technology has attracted women's attention and support. Women's groups, NGOs and community-based organizations (CBOs) have shown a high level of interest in this technology and the demand for the kits is growing (Herbert, 2002).

In addition to drip irrigation that delivers water more efficient to crops, pumping technologies have been proven to be beneficial to farmers in terms of increased area of production, especially if the water pumped is distributed and applied efficiently. Among the most exciting and potentially beneficial technologies is the range of manually operated pumps that have been (and continue to be) used in Kenya and other water-scarce countries in Africa. Manual pumps seem to offer a more socio-economic and technically balanced product to the farmers (Herbert, Murray-Rust & Mutero, eds. 2002).

2.5.1 Community Level Management of River Resources

Even though the concept of Integrated River Basin Management (IRBM) is growing in contemporary times basically for the benefit of the local riparian communities, there has been little consideration of local traditional river management systems. Most basin resources management projects are implemented with little or no integration of traditional customs and beliefs which traditionally had preserved many rivers especially in Africa (World Bank, 1993).

In a series of researches conducted by Dittoh, (1998); Mensah, (1999); Kasanga & Kotey, (2001) in the Volta Basin, it was noted that the role of traditional authorities is more important in the domain of water rights. In twelve villages, the chiefs or lords of the land were said to be custodians of the basin water for the people; in six others, it was perceived that the community, or everybody, owned the water. The ownership of water resources was attributed to the government in only two villages. In four villages where conflicts over water resources were encountered, it was always the chiefs who solved the quarrels in cooperation with the unit committee (Dittoh, 1998; Mensah, 1999; Kasanga & Kotey, 2001).

Varying from the south to the north of the Basin, it is mainly chiefs or lords of the land who directly or indirectly administer water user rights: directly, by allocating water withdrawal or fishing rights, and indirectly, by allocating rights to land which lies adjacent to water. In the latter case, water withdrawal rights are implicitly included, since riparian water rights are commonly acknowledged in Ghana (Dittoh, 1998; Mensah, 1999; Kasanga & Kotey, 2001).

In Ghana and Burkina Faso, Lautze et al, (2008) note that the body of literature concerned with customary water management has grown considerably in recent years. Opoku-Agyemang, (2001) explains the indigenous institutions in Akan cultures which have invariably tie the management of natural resources to their religious belief system. According to Akan beliefs, the earth was accorded a spirit of its own, which could be helpful if propitiated or harmful if degraded. Land was inherited from the ancestors. Chiefs and priests were entrusted the responsibility of ensuring that ancestors and gods received proper respect, exercised control over the land and its resources to promote conditions which were beneficial to the environment and sustainable for communities (Ministry of Works and Housing, (1998); Opoku-Agyemang, 2001).

To achieve their goals, chiefs and priests enforced a set of rules which were intended to protect the earth and regulate the use of natural resources. Most importantly, a river's waters were considered holy. Desecration in or around them was, therefore, prohibited as was farming on river banks (as these areas were considered resting abodes for river gods and their children). Further, beliefs concerning tree deities entailed demarcation of certain forest areas as sacred groves (in which no human activities were permitted), thereby minimizing deforestation and soil erosion. In addition, certain areas were usually designated for gathering water and these areas were generally and logically situated upstream from areas of other activities which may harm the water (Opoku-Agyemang, 2001).

Odame-Ababio, (2002) also note that certain days of the week were considered non-working days. Activities such as washing clothes, water abstraction, or fishing were prohibited—helping to make use of water and exploitation of resources therein more sustainable (Ministry of Works and Housing, 1998b)

The practices and institutions prevalent in Ghana appear largely similar to those found in the Volta's upper reaches in Burkina Faso. A couple of examples taken from the regions occupied by the Mossi (who comprise over 40% of Burkina Faso's population) indicate that water is treated as sacred, and regulatory functions are played by chiefs and priests to maintain sanitation in villages and promote a certain degree of conservation. Sustainable water management practices were achieved through measures similar to the Volta's downstream portions; "traditional [water] management is founded on practical logic", wrote a French observer to colonial Upper Volta (Ramatou, 2002 cited in Youkhana, Lautze & Barry, 2008).

Similar to the Ghanaian portions of the Basin, water was both a private good and public property. The resource belonged to the entire community, but could be used for personal benefit as long as the collective good was not harmed (Ramatou, 2002). Land tenure appears equally similar to the examples in the Ghanaian regions of the Volta Basin, as inheritance stemmed from the ancestors while chiefs (chef de la terre) and earth priests (maitre du sol) wielded regulatory powers. Drinking and household use of water was (and still is) under the control of earth priest (FAO, 1997).

However, in Burkinabe regions of the Basin, a higher percentage of the population is in the Islam religion, which may alter many of the traditional religious beliefs on which customary water management, is based. Many examples of religious syncretism nevertheless pervade the region, allowing traditional practices and institutions to persist in an altered form; in an example from the Sourou region, sacrifices to the river gods were discontinued while most other traditions preserved (Youkhana, Lautze & Barry, 2008).

While it can be assumed that the customary water management practices and institutions evolved relatively independently for centuries, the British and French colonial incursions substantially altered the geographic and institutional landscape of the Volta Basin (Youkhana, Lautze & Barry, 2008). Opoku-Ankomah et al, (2006) also assert that the breakdown of some of the regulatory mechanisms and the undermining of community level institutional arrangements in many rural parts of the Basin can be attributed to the advent of colonialism, Christianity and Islam, migration and the introduction of modern technology.

2.5.2 Government and Civil Society Contributions in the Management of River Resources

The role of government and civil society in the management of river resources is very important. In recent times international civil society efforts and the policy direction have brought together the partners in the Nile basin under the umbrella of the Nile Basin Initiative (NBI). It is clear that this is a start of a long journey, which could collapse at any time unless otherwise supported by all the necessary

instruments, including empirical research results on the benefits that could be achieved from the co-operation and the mechanisms to strengthen it (Kamara & Girma Tadesse.(eds), 2003).

In a research conducted in 2001 by the Ministry for foreign Affair of Sweden, it was found out that the role of civil society whether at regional or national level varies greatly across the case studies examined. On the balance, however, the role of civil society in transboundary water management is limited. Whilst integration and participation in regional structures at a state level is well-developed in some countries, the involvement of civil society as a participant in developing policy and programmes is limited. The research, however, noted that some nascent indigenous NGOs looking in particular at issues surrounding the environment and dam-building are emerging. In southern Africa there are some internationally important examples of civil society involvement in water management issues on the Okavango, but where the focus is not on internationally protected sites on the Incomati for instance- the focus is less sharp (Sweden Ministry of Foreign Affairs, 2001).

In southern Africa, civil society has been playing a very important role to influencing public and international decision making and policy on water management, but this role has been largely subordinated to greater political concerns in recent years, with some important exceptions. Certainly the role of international civil society has perhaps been more significant in some countries than that of indigenous civil society. In the case of the Okavango River Basin, interest groups (from both the national political domain and the international community) played a crucial role during the

early 1990s when the government of Botswana started planning the Southern Okavango Integrated Water Development Project which was subsequently shelved.

The International Union for the Conservation of Nature (IUCN) and Greenpeace International (GI) played significant roles with respect to this decision, the former producing a report that warned of the negative environmental and social consequences of the project on the Okavango Delta. Nevertheless, the formal participation of non-governmental organizations in decision-making processes within the region remains rather poorly developed (Sweden Ministry of Foreign Affairs, 2001).

In the Incomati River basin, civil society can play an important role in redressing the balance between different interests within the basin, for example, the Sugar Industry and commercial farming interest are both well organized and represent significant proponents of dam-building on the river, but may not have a full appreciation of possible negative social and economic effects of dam construction. There is certainly a role for civil society to play in assisting the process of effective water resource development in such a basin, not least through helping to provide a channel of data on economic and social effects of changing water management and allocation practices (Sweden Ministry of Foreign Affairs, 2001).

In a series of research conducted in 2004, 2005 and 2006 by Youkhana, Korth, Lamizana and Charlotte van der Schaaf in the Volta Basin in Ghana and Burkina Faso, they observed that there is a wide range of actors involved in the water sector

at all levels. Nationally, water tends to cut across the remit of several different government ministries, while donors and multilateral development agencies (World Bank, EU) and bilateral foreign state development agencies from Canada (CIDA), Denmark (DANIDA), France (AFD), Germany (GTZ/KFW), Japan (JICA) also play key roles.

Internationally, external finance institutions, UN and other international organizations (e.g. Water Aid, Plan International), and global institutions such as the Global Water Partnership (GWP), GLOWA Volta Project, IUCN among others all contribute to the development and implementation of water policies and practices. Locally, civil society organizations, private sector companies and local government agencies have also been contributing to the extension of water services and sanitation systems and have been involved in the construction of small dam reservoirs for the rural population. These actors can be distinguished by their principal levels of institutional operation (Youkhana, Korth, Lamizana and Charlotte van der Schaaf, 2006).

According to Koku, (2002) in a research conducted in the Nadowli District of the Black Volta Basin, he found that the GEF/UNDP has developed communities' capacities and is creating opportunities for the community members to invest in sustainable land management, livelihood enterprise development, improved market and trading in savannah woodland products as a way of ensuring poverty reduction within the context of the United Nations Convention to combat desertification in the Nadowli District (Koku, 2002).

In many cases, donors are advocating an increased role for civil society in developing water delivery systems in agricultural and domestic sectors. Enhancing civil society roles in wider regional level processes as well as supporting local-level development is a part of the development of effective international water management as a public good. However, substantial barriers to effectively extending the role of civil society at a regional level need to be overcome (Sweden Ministry of Foreign Affairs, 2001, Kasanga & Kotey, 2001, GLOWA Volta, 2004).

CHAPTER THREE

RESEARCH METHODS

3.1 Introduction

This chapter looks at the general characteristics of the Bawku area in terms of geographic features, demographic pattern and distribution, socio-economic dimension and the fresh water situation. The chapter also spells out the methodological design for the collection of data for the research. By knowing the characteristics of the study area, one is able to design comprehensive methods of collecting data.

3.2 Research Design

Social research is a varied phenomenon. Therefore, there is no single method that is best for all types of social researches. However, given the nature and the objectives of this study, survey research was deemed appropriate. This is because; survey research allows in-depth study of social phenomena by the use of face-to-face interviews, which indeed, was the case for this study. It also allows the use of quantitative and qualitative techniques in the collection and analysis of data.

3.3 The Study Area

The study area comprises Bawku West District and Bawku Municipality of the Upper East Region. The area forms part of the White Volta Sub-Basin, which covers

a total land area of about 106, 000 km.^{2} The White Volta flows from Burkina Faso and enters Ghana through the area. It contributes about 20% of the annual flow of water to the Volta Lake (Gordon & Amatekpor, 1999). The area lies roughly between 10^0 30'N and 11^0 10'N, and between longitudes 0^0 20'E and 0^0 35'E. The area which has a total land area of about 2,285km^2 represents about 32% of the total land area of the Upper East Region (Dickson & Benneh, 1995).

The area is underlain mainly by birrimian rocks and its associated granitoid intrusive formation with savanna vegetation type (Dickson & Benneh 1995). Ambient temperature in the area is relatively high throughout the year with an average of 28.6°C (Meteorological Service Bolga/MOFA-Zebilla 2001). In a general climatic characterization, the Upper East Region in which the study area is a part belongs to the semi-arid tropics.

The area experiences a single rainfall regime with a maximum from May to October. A significant feature of the rainfall pattern is its variation and unreliability. The prolonged dry season, which occurs from November to April, leads to the drying up of rivers, dams, wells and boreholes. This poses a serious threat to farming which is the main occupation of the people both in the rainy and dry seasons (IFAD, 1990).

According to the 2000 Population and Housing Census, both the Bawku Municipality and the Bawku West District have a combined population of about 288,885 out of the approximate 1,000,000 inhabitants in the Upper East Region. Household sizes are averagely large of about seven persons per household.

Agriculture is the dominant occupation of the people of the area, accounting for about 80% of the total employment. The major crops grown in the wet and dry seasons are millet, sorghum, maize, rice, groundnuts, leafy vegetables, pepper, water melon, onion and livestock such as cattle, sheep, goats, donkey etc. Animals such as cattle, sheep and goats as well as poultry, especially, guinea fowl, production is very significant. Farm sizes range between one and two hectares as a result of high population density. Yields are very low as compared to other parts of the country due to poor soils and unreliable rainfall. Also farmers are not able to get enough organic manure or purchase chemical fertilizers. These factors, coupled with the fact that farming is predominantly undertaken by older men and women lead to food shortages in the area (Bawku Municipal & Bawku West District Profiles, 2006).

There are a few dams and dug-outs which are being used for dry season gardening. Farmers also dig into the sand of dry riverbeds to get water. There are also on-going projects for the rehabilitation of dams and construction of new dams under LACOSREP II and the Village Infrastructure Projects (VIP) (IFAD, 2004).

The major cash crops in the area include; onions, tomatoes and Soya beans, tomatoes and onions which is often referred to as "Bawku cocoa". These crops are often cultivated in the dry season (MOFA Bawku, 200).

With a poverty incidence of 88 % in 1998/1999, the Upper East Region of which the Bawku area is a part is the region with the largest portion of poor people (Ghana Statistical Service, 2000). Oboli, (1978), wrote about the north-south contrast in

agricultural production that "the north is much poorer, living mainly on subsistence farming, and is faced with the severe problem of water-supply, climatic severity, distance from ports and poverty". Indeed, this assertion is still valid in contemporary times.

Despite the high level of cross border trade, the level of unemployment is very high in the area especially among the youth. Agricultural pursuits dominate the employment scene, about 80% of the active population are into agriculture and the situation of unemployment is worse during prolong dry season when no farming activity takes place, except in a few communities where there are small scale dams for dry season gardening. This compels most of the youth to migrate to the southern sector of the country to look for jobs (Ghana Statistical Service, 2000, IFAD, 2004).

The predominant tribes in the area are Kussasi, Mamprusi, Bissa and Moshi with Kussasi forming the majority followed by Mamprusi. However, there are quite a number of migrants from other parts of the country (most of whom are civil servants) and the neighbouring countries like Togo and Burkina Faso. Ethnic heterogeneity has had implications for harmony in the municipality. In the very recent times, there have been sporadic violent ethnic clashes between the Kussasi and Mamprusi ethnic groups (Lund et al, 2006). It is expected however that, inter-marriages among the diverse ethnic groupings will provide the impetus for peaceful co-existence. Despite the varied tribal components of the municipality, the society is generally patrilineal and traditionally male dominated. Women are generally less active in decision making but are more traditionally responsible for the bulk of the households

activities such as planting, weeding, harvesting and selling as well as cooking and fetching of water (Bawku Municipal & Bawku West District Profiles, 2006).

The area is governed by both traditional leaders (Chief, Tindanas etc) and modern political leaders (Assemby persons, unit committee leaders etc). There are several social groupings in the communities (farmers groups, fishermen groups, herdsmen groups etc). Several governmental and non governmental organisations are working in the Bawku area (MOFA, NADMO, WRC, IUCN, ZOVFA, Action Aid, etc).

3.4 The Study Population

The target population for the study included all heads of households in the riparian communities as well as the River resource users groups (farmers, fishermen, herdsmen etc). The study also considered opinion leaders (Chiefs, Tindanes, and Assemblypersons and among others. Staff of Government and Non Governmental Organisations working in the management and preservation of the White Volta such as DMA, WRC, MOFA, GLOWA Volta, IUCN, and ZOVFA also form part of the population for the study.

3.5 Sampling

3.5.1 Sampling Technique

Both probability and non probability sampling techniques were employed for the study. Purposive sampling technique was used to select three towns in the Bawku area for the study. Simple random sampling technique was used to select households whilst purposive sampling technique was used to select household respondents.

Purposive sampling technique was further employed to select opinion leaders, stakeholders, staff of NGOs and government agencies working in the area of river resource preservation and management.

3.5.2 Sampling Procedure

Sampling opinion leaders

Opinion leaders and stakeholders were selected based on their role, contribution or their engagement in the management of river resources in the communities. In each of the study towns (Sapeliga, Mognori and Temonde) there exist a Chief and a Tindana who traditionally handle issues of natural resources such as land and water. Therefore, the three Chiefs and the three Tindanas were selected. More so, each town had an Assemblyperson and this also made it easy for them to be selected. In the end, three Chiefs, three Tindana, three Assembly persons were included in the sample for the study.

Sampling river user groups

There are about 15 different user groups in the three study towns. In Sapeliga alone there are about seven (7) user groups which comprise four (4) crop farmers' associations, one (1) fishermen/canoe operators association, two (2) livestock farmers association. One crop farmers association by name Asontaba Farmers' Association was purposively selected because the Association is registered with MOFA, holds regular meetings and also has a bank account. This made it easy for scheduling meetings with them. Out of the two livestock farmers associations, one was selected because it had active membership and was also registered with MOFA.

The only fishermen/canoe operators association was selected even though it had no registration. However, its membership was active.

Mognori had five associations comprising three (3) crop farmers associations and two (2) livestock farmers associations. Out of the three crop farmers associations, only one (Mognori Farmers Association) was active in terms of holding regular meetings and was therefore selected. One livestock farmers association that is the Mognori Livestock Farmers Association was also selected based on the same reasons informing the selection of the crop farmers association.

In Temonde there was only one recognized user group. This was the Temonde Farmers Association and therefore was selected to be part of the sample. In all six (6) groups were purposely sampled for the study, three (3) from Sapeliga, two (2) from Mognori and one (1) from Temonde.

Sampling Governmental Organisations

There are several different governmental organisations in the study area. However, based on their roles in the management of the River, few were selected for the study. In the end five government organisations formed part of the sample size of the study. They included the Water Resources Commission (WRC), Ministry of Food and Agriculture (MOFA), Forest Service Division (FSD) of the Forestry Commission, National Disaster Management Organisation (NADMO), the Bawku Municipal Assembly and the Bawku West District Assembly.

Sampling Non Governmental Organisations

There are several Non-Governmental Organisations (NGOs) operating in the study area however, very few are directly engaged in the management of the White Volta. Sampling was therefore limited to NGOs that had direct roles in the management of the River. In the end only the International Union for the Conservation of Nature (IUCN), the GLOWA Volta Project and its partners and the Zuuri Organic Vegetable Farmers Association (ZOVFA) were included in the sample.

Sampling Household Heads

The three study towns, which are Mognori, Sapeliga and Temonde, were stratified into communities according to either their traditional demarcations or electoral areas. Sapeliga for instance, had about eight communities of which only four were purposively sampled for this study. Timonde and Mognori had mainly four communities each of which all were considered. The choice of the communities was based on the extent to which people have access to and are using the White Volta for their livelihood.

Simple random sampling technique was used to select at least 10 houses from every community. In each house, one household was randomly selected and the household head was interviewed. In the end a total of 110 household heads in the ten communities were sampled and interviewed.

3.6 Sample Size

The sample size for the study included; nine (9) opinion leaders, six (6) river user groups, five (5) governmental organisations, three (3) non-governmental organisations and one hundred and ten (110) household heads.

3.7 Data Collection Methods

Several methods were used in collecting both quantitative and qualitative data for the study.

3.7.1 Face-to-face Interview

With the aid of a questionnaire, face-to-face interviews were conducted to household heads in the selected communities to seek views on the usage and management of the White Volta. The main reason for the face-to-face interviews was to elicit information on how households use and maintain the River for their livelihood and factors that thwart the efficient use of the River. The face-to-face interviews also helped to elicit information on local management systems of the river resources.

This method was deemed suitable because it provided the opportunity for the household heads to respond to the questions without any intimidation as it could be in fora.

3.7.2 Community Fora

Three community fora were organized, one each in the three study towns. The participants who included male, female, old persons, young persons were drawn from all facets of the towns. The fora were organized on market days with assistance

of the "market announcers" who went round the market to inform people about the fora. The market days made it easy to get people from different parts of the towns to participate in the fora. At least, thirty (30) participants attended each of the fora organized. The main aim of the fora was to provide platforms for every member of the communities to exchange experiences, engage in constructive and collective deliberation, and propose workable solutions to issues affecting their common use of the White Volta resources.

To this effect, a number of thematic areas such as the types of livelihood activities taking place along the River, types of customary river management practices in the communities, government and non-governmental organisations working in the management of the River, the impact of the Bagre dam on their use of the River, local river management practices, community reaction to recent interventions and general factors challenging or promoting the use of the River in the communities.

3.7.3 Focus Group Discussions

A number of focus group discussions were also organized for the various river resource user groups in the communities. These groups included crop farmers groups, livestock farmers and herdsmen groups, fishermen and canoe operators groups and women farmers groups. The participants in the group discussions were mainly the executives of the associations and others who were interested in the issues being discussed. An average number of eight (8) people participated in all the crop farmers' group discussions, the livestock farmers/herdsmen group discussions and

the fishermen and canoe operators' group discussions and the women farmers' group discussions.

Unlike the community fora where all manner of persons participated and the nature of questions so general, the focus group discussions indeed, provided a platform for the user groups and associations to specifically highlight on the nature of their activities along the River as well as their problems and concerns on the use of the River for their activities. During discussion with women irrigation farmers' for instance, specific issues such as their access to land for irrigation as well as their benefits from the River resources were raised. The group discussions further provided a congenial atmosphere to cross check information collected from household heads and institutions.

3.7.4 Interviews

Interviews were held for the various institutions working on the management of the River at the communities' levels or at the basin level. A set of structured questions were designed separately for each institution. Institutional heads or their representatives were the targets for these interviews. They were interviewed on issues such as their areas and reasons for interventions, their progress and challenges as well as their general views about transboundary water management and its relationship to poverty reduction in the Bawku area.

Among the institutions interviewed included: ZOVFA, Water Resources Commission – White Volta Basin Office in Bolgatanga, Bawku West District and

Bawku Municipal Assemblies, the District/Municipal Directorates of the Ministry of Food and Agriculture (MOFA), National Disaster Management Organisation, and Bawku Municipal Forest Service Division of the Forestry Commission. Traditional leaders and Assembly persons in the communities were also interviewed.

3.7.5 Observations:

The researcher directly observed the livelihood activities taking place along the River. Observation provided the researcher the opportunity to familiarize himself with the various types of livelihood activities taking place along the River as well as environmental issues that have implications for sustenance of the River resources.

3.8 Data Handling and Processing

The data from the field was processed and edited. This process allowed for consistency of information collected from the field, hence, helped to prove the accuracy and appropriateness of the data.

The questionnaire was coded and entered into a computer programmes known as Statistical Package for Social Science (SPSS). The SPSS programme was used to translate responses into statistical tables. The MINITAB Statistical Package was also used to compare means of crop yields. The results were discussed in line with the objectives of the study.

Qualitative data was in the form of notes and tape recordings, taking during the interviews and fora. The notes were coded, analysis and discussed to meet the

objectives of the study. Tape recordings were also transcribed and analysed in line with the objectives of the study. Qualitative data was analysed and discussed alongside the quantitative data.

3.9 Ethical Principles Guiding the Study

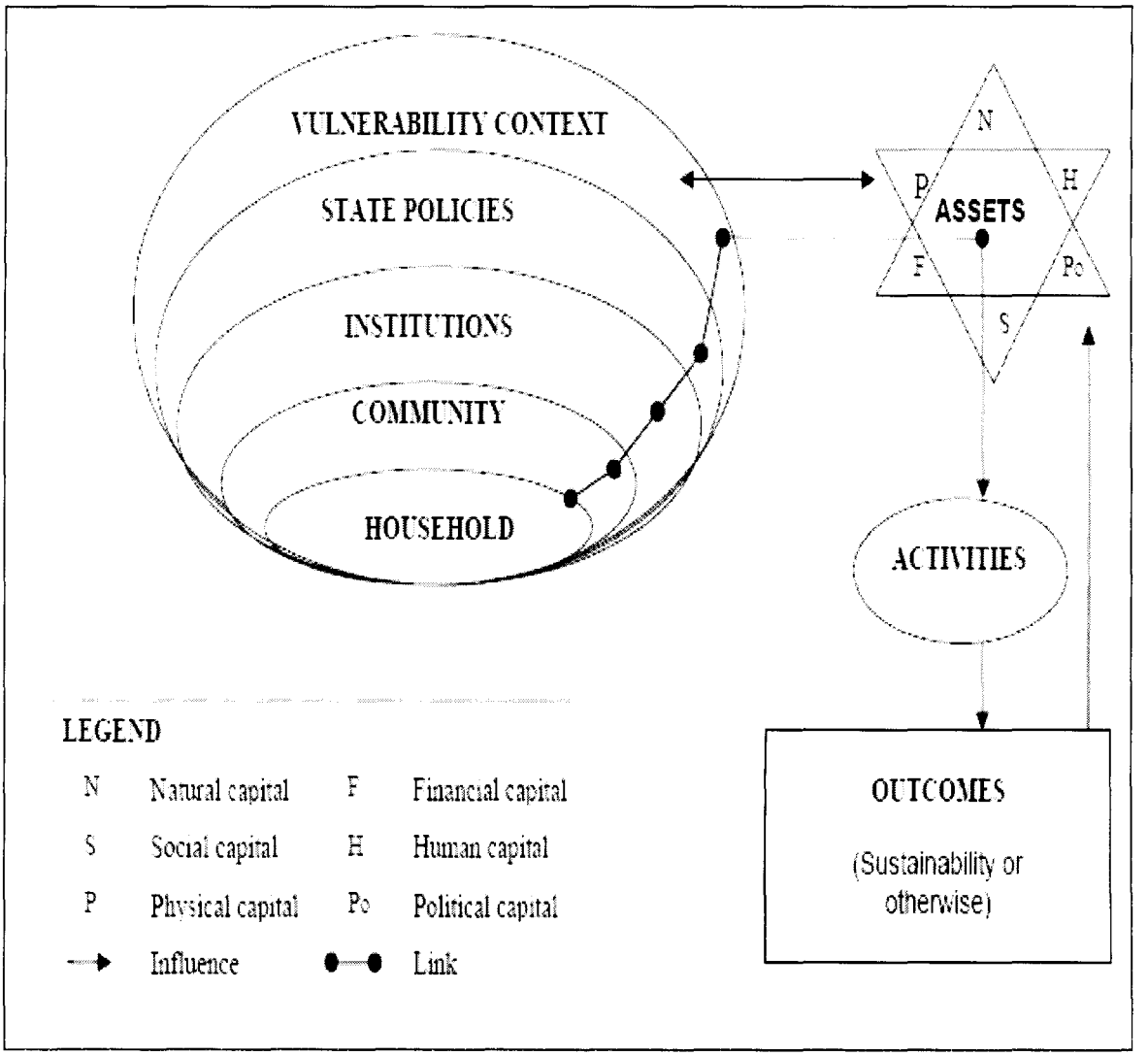
The study was guided by the following ethical principles:

- The consent of all respondents of the study was obtained via introductory letters issued by the University as well as personal introduction by key personalities in the study communities. Participation at all levels of the study was voluntary and based on informed consent.
- All information acquired during the study was treated as highly confidential and will only be made available to others with consent of the participant.
- To avoid breach of plagiarism, all references and sources of information were cited and acknowledge appropriately.
- All community values, norm and taboos were respected accordingly.

3.10 Conceptual framework for Livelihood Studies

Livelihood is a complex concept that requires a comprehensive framework for its analysis (Tsikata, 2005). Even though there is no clear theoretical framework for the study of livelihood in river basins, the study has adopted the Sustainable Rural Livelihood framework (SRL) used by Scoones (1998); Bebbington (1999); Carney et al (1999); Ellis and Freeman (2005) and Tsikata (2005). Figure 3.1 is a diagram showing the Sustainable Rural Livelihood framework adopted for the study.

Fig. 3.1 Sustainable Rural Livelihood framework



Source: Scoones, 1998

Some distinctive features of the livelihoods framework are that it takes an 'all-round' view of people's means of gaining a living, including the social and institutional circumstances in which people's livelihoods are embedded. As shown in the diagram in fig. 3.1, at the centre of the framework is a relationship between the assets or resources that people own or can obtain access to, including land, irrigation water, and skill and education levels of family members, which are categorized as natural,

human, social, financial and political capitals (Scoones, 1998; Nicol, 2000; Ellis and Freeman, 2005).

The households utilize these assets in their productive activities in order to create income and satisfy their consumption needs, maintain their asset levels and invest in their future activities. The access to the assets is strongly influenced by the vulnerability context which in the case of this study includes seasonal factors (rainfall and climate change), policies and institutions that affect livelihood activities in the Volta Basin. Ellis further explained that livelihood activities include farm and non-farm activities, transfers among others (Ellie, 2000).

The SRL framework considers water resources essential in the analysis of livelihoods. Firstly, it builds on better understanding of multiple perspectives and values water as economic capital (agricultural input, domestic needs), physical capital (irrigation infrastructure), managerial and institutional capital (water organisations), social capital (collective action) as well as political capital (Ashley and Carney, 1999, cited in Nicol, 2000). It assesses gains and losses of the rural poor from water reforms (Lankford, 2003). It improves the knowledge of the context from the local level upwards and helps to analyze opportunities and constraints of the rural poor to benefit from the changes within the given context (Nicol, 2000). It helps to identify what options have better potential to reduce poverty within the given context and what enabling conditions, policies and incentives are needed for the poor to increase the range of better livelihood options (Scoones, 1998; Ellis, 2000; Moriarty et al, 2004; Lankford, 2003).

CHAPTER FOUR

LIVELIHOOD ACTIVITIES ALONG THE WHITE VOLTA

4.1 Forms of Livelihood Activities taking place along the White Volta

Several livelihood activities were identified along the White Volta in the study communities. Table 4.1 is a catalogue of activities taking place along the River from which households and individuals in the communities derive their livelihood.

Table 4.1 Heads of Household Report of Livelihood Activities along the River

Livelihood Activities	Household Respondents		
	Total # of Respondents	Frequency	Percentage
Rainy Season Cropping	110	110	100
Dry Season Gardening	110	79	71.8
Livestock Rearing	110	110	100
Fishing and River Transport	[illegible]	16	14.5
Sand Winning and Brick Molding	110	16	14.5

Results from Table 4.1 demonstrate that all households in the riparian communities are engaged in crop farming in the rainy season as well as livestock rearing. About 71.8% of the respondents are involved in dry season gardening for a living. Very few inhabitants, about 14.5% are engaged in fishing and river transportation as well as sand winning and brick molding. The result also demonstrates that the riparian

communities are predominantly agrarian. However, households are engaged in more than one activity along the River for their living.

The ensuing sections give analysis of livelihood activities along the River and how engagement in these activities improves the wellbeing of the riparian communities.

4.1.1 Rainy Season Cropping along the White Volta in the Communities

As indicated in Table 4.1, rainy season cropping is the dominant livelihood activity in the riparian communities. The major crops cultivated in the rainy season are millet, rice, guinea corn, maize, beans and varieties of vegetable crops. This finding confirms the result of IFAD (2004) that rain-fed agriculture is the dominant livelihood activity for most rural households in northern Ghana.

Most of the respondents however complained that poor rainfall is affecting rainy season cropping in the communities. Indeed, poor rainfall and loss of soil fertility have been noted for crop failure in the Northern Regions of Ghana (IFAD, 2004; MOFA, 2006). The Bawku Municipal Directorate of MOFA and Manga Agricultural Research Institute (2006) also reported that the Bawku area experiences averagely only one successful rainy season out of every five rainy seasons. Indeed, this assertion is frightening considering the fact that most people in the area depend predominantly on rain-fed agriculture.

Responses from the household interviews have, however, shown that farm lands located in the River plains give comparatively higher crop yield than those located

far from the River plains. Of course, river plains are often fertile and drought resistant therefore making those areas productive and very attractive to farmers (Global Water Partnership, 2004). Table 4.2 demonstrates the mean differences of crops cultivated near and far from the River plains.

Table 4.2 Average Crop Yield near and far from the River Plains

Type of Crop	Location of Farm	Mean Yield per Acre	F-Values	P-Value	Remark
Guinea Corn	Near the River	5.7	2.6	0.000	Significant Difference
	Far from the River	3.1			
Maize	Near the River	7.3	3.9	0.000	Significant Difference
	Far from the River	3.4			
Millet	Near the River	6.2	3.1	0.000	Significant Difference
	Far from the River	3.1			
Rice	Near the River	10.2	5.4	0.000	Significant Difference
	Far from the River	4.8			

Result from Table 4.2 shows that there is much yield of crops such as guinea corn, maize, millet, rice and among others when they are cultivated along the River than when the same crops are cultivated far from the River. The F-Values which estimate the difference of the two means has shown a remarkable difference of crop yield between those cultivated along the River and those cultivated far from the River. For example the F-Value of 5.4 for rice indicates that holding other things constant when a farmer cultivates rice along the River during the rainy season he or she would gain about 5.4 bags per acre extra than when he or she cultivates the same crop far from the River.

Owing to the fact that rainy season cropping along the White Volta River gives higher yield, many households in the communities are attracted to farm close to the River. At a community forum in Timonde community, most of the participants claimed farming on most lands located far from the River is a waste of energy and resources. One of the participants, Alin Moses affirmed that;

My rice and maize farms located along the River produce about 11bags per acre and 7bags per acre respectively, this yield far exceeds yield from my farm land located away from the River which gives me about 7bags per acre of rice and 3bages per acre of maize.

Indeed, this statement tells the extent to which the River resources help in mitigating the effects of droughts on crop yield during the rainy season. The contributions of the River resources in enhancing rainy season cropping have a myriad of developmental

implications. Of course, poverty is the overriding problem of development in the entire Upper East Region in which the Bawku area is a part. Eight out of ten people are considered poor in the area (GPRS, 2006). Even though several reasons account for poverty in the area, the outstanding causes according to the GPRS (2006) are low agricultural production, steaming largely from erratic rainfall and poor market for agricultural products. These reasons, coupled with the fact that the area lacks alternative livelihood activities and increasing population pressure make life unbearable (IFAD, 2007).

Therefore, improved crop yield along the River in the rainy season invariably is a great assurance of food security and improved income in the riparian communities. This finding confirms other researches conducted by GLOWA Volta (2002) and IUCN (2004) which asserts that the White Volta River resources have great potential for reducing poverty in the riparian communities. The report explained that with one rainy season and unreliable rain-fed agriculture, the management of the White Volta water resources could contribute immensely to poverty reduction in the Basin.

The study, however, found that crop farming along the River though beneficial, is challenged with a serious threat. At the community fora in the three communities, flooding was mentioned as the main threat to rainy season cropping along the River. It was claimed by participants that flooding has become rampant in recent times and the effects are always devastating. In 1988, 1998 and recently 2007 the Bawku area and other riparian communities of the White Volta experienced severe floods (WRC,

2007). The Government of Ghana declares the area as disaster zone needing interventions (Red Cross International, 2007).

Most participants at the community fora recollected the effects of the floods that occurred in August to September, 2007. They explained that farms, roads and houses were submerged and lives lost as a result. At the community forum in Mognori a participant lamented;

I completely lost my farms along the River; I have been buying food to feed my family.

Indeed this tells the extent to which the recent floods caused havoc in the area. At the community fora participants associated the causes of the floods to ineffective communication between Ghana and Burkina Faso on the opening of spill ways of the Bagre dam in Burkina Faso. The participants complained of late receipt of information on the opening of the Bagre dam. It was stated that the communities often receive information on the opening of the Dam at the time that they can not rescue any thing along the River.

4.1.2 Dry Season Gardening along the White Volta River in the Communities

Interview results from the community fora indicate that dry season gardening along the River is a traditional activity which was practiced mostly by older men using Bucket irrigation method. Bucket irrigation was explained as a traditional system of irrigation whereby, simple tools are used to cultivate relatively smaller pieces of land near the River. With this form of irrigation, buckets and watering cans are normally

used to fetch water manually from either the River or from wells dug on the River bed or on the River banks, to water crops. The farmers, however, complained that this method of irrigation is tedious, time consuming, and less productive.

Interview results from household heads and farmers groups have shown that dry season gardening has become intensified in the riparian communities, employing about 71.8 percent of the household heads interviewed. Tractors are often used to till the land and water pumping machines are usually used by some farmers to draw more water from the River. Different kinds of vegetable crops such as onion, pepper, water melon, tomatoes and among others are irrigated in commercial quantities. This might ensure food security and improved income in the communities. Van de Giesen (2005) reported that over the past ten years irrigation via hand-dug shallow wells and pump machines have been spreading in the White Volta and have been contributing to poverty reduction in the riparian communities. Table 4.3 shows the average yield of the main vegetable crops irrigated along the River in the communities.

Table 4.3 Average Yield of Irrigated Crops in the Communities

Type of Crop	Ton/ha
Onion	3.3
Water Melon	2.9
Tomato	2.1

Source: MOFA, Zebila 2007

At the community fora it was explained that many households and individuals resort to dry season gardening as an alternative livelihood to the unreliable rain-fed

cropping. Mr Avoka a 60-year old irrigation farmer in Sapeliga lamented at a community forum;

We cultivate crops in the rainy season however; we normally face droughts and or floods leading to crops failure. As a result we have resorted to dry season irrigation for income generation and food security.

This implies that dry season cropping is contributing to income and food security in the riparian communities. Results from interviews with farmers indicate that dry season irrigation activities along the River have become more intensified since the construction of the Bagre Dam in Burkina Faso in 1993. The construction of the Dam has created a new hydrological regime whereby excess water for hydroelectric generation from the dam continuously flows all year round (GLOWA Volta, 2002). This has resolved the perennial drying of the River and has therefore made dry season irrigation the most prominent activity in the riparian communities.

One remarkable development in dry season gardening in the communities is the cultivation of some cereal crops such as rice and maize which were hitherto cultivated only in the rainy seasons. The research found that the mean yield of rice and maize irrigated per acre is higher than the cultivation of the same crops in the rainy season. Table 4.4 shows the difference of mean yield per acre of rice and maize irrigated in the dry season and those cultivated in the rainy season.

Table 4.4 Comparative mean of Crop Yield Irrigated in the Dry Season and those Cultivated in the Rainy Season

Type of Crop	Season Cultivated	Mean Yield per Acre	F-Values	P-Value	Remark
Rice	Dry season Irrigated	13.2	3.0	0.000	Significant Difference
	Rainy season Cultivated	10.2			
Maize	Dry season Irrigated	10.7	3.4	0.000	Significant Difference
	Rainy season Cultivated	7.3			

Result from Table 4.4 demonstrates a remarkable difference between the mean yields of rice and maize irrigated and those cultivated in the rainy season. The F-Values shows that there is difference of 3.0 and 3.4 bags per acre of rice and maize respectively when such crops are irrigated in the dry season. The P-Value of 0.000 for both crops statistically signifies that there is a higher yield of rice and maize per acre when such crops are irrigated in the dry season.

This finding has a very important implication for food security in the communities, because such food crops often fail during the rainy season cultivation (IFAD, 2004). According to participants at the focus group discussion with farmers at Sapeliga, it was stated that if farmers' capacities are enhanced to irrigate these and other food crops such as sorghum, it would save the communities from perennial food shortage.

Perennial food shortage is a major cause of poverty in the Northern sector of Ghana (GSS, 2002).

One remarkable development in the communities is that irrigation farmers have formed Associations to enable them access support from the government, financial institutions and Civil Society Organisations. Interestingly and commendably, females are compulsory members of these Associations. According to the farmers, female membership is a condition for accessing credit from many organisations. At an interview with a group of female farmers, they stated that because of this compulsory clause, women's access to credit and irrigation land has been enhanced.

This invariably, contributes to the overall poverty alleviation and empowerment of women in the communities. According to Van de Giesen *et al.* (2001) in a similar study in the Upper East Region of Ghana, it was found that technologies like irrigation positively contribute to the overall poverty alleviation and empowerment of women. They observed that women had direct access to irrigated plots because land allocation at the irrigation sites is undertaken through water users groups which are bonded by a clause that states that 50 percent of the group members shall be women.

By observation it was found that most of the activities in the irrigation areas heavily depend on labour of women. These activities include, transplanting, harvesting and winnowing of rice.

4.1.3 Livestock Rearing in the Riparian Communities

Livestock rearing is one important livelihood activity in the riparian communities. All the household respondents in the three communities claimed they are engaged in livestock rearing for a living. According to the livestock farmers in an interview, they stated that the rearing of livestock such as cattle, sheep and goats in the riparian communities is profitable. As a result they use their profits gained from crop farms and other business to purchase livestock for rearing. Livestock are often referred to as quick sources of money or "moving banks" for most households. In similar researches conducted at the middle and lower Volta Basin, Tonah (2005) and Tsikata (2005) note that livestock rearing is an important livelihood activity that employs and provides income to many people.

Different kinds of livestock such as cattle, sheep, goats, donkeys as well as poultry were found as the dominant livestock reared by farmers. According to the farmers in an interview, it was explained that livestock rearing in the communities is largely enhanced by the River resources which provide abundant water and pasture for the rearing of different livestock. The farmers asserted that, unlike non-riverside communities whereby livestock rearing is often hindered by water shortage and lack of pasture during the dry season (often resulting in animal emaciation and death), the riparian communities are blessed and do not encounter similar challenges.

The River water as well as the flood plains provides abundant pasture and drinking water for livestock rearing. More so, remains of late crops harvested at the River side, such as sorghum, rice and beans are often collected to feed animals in the dry

season. Figure 4.1 shows some of the livestock in the communities. Even though the photographs were taken in the dry season, the animals look very healthy.

Figure 4.1 Photographs of Livestock in the Communities

Results from the community fora shows that animal rearing has been a traditional practice. Every household often keep different kinds of animals for various purposes including religious, marital and transportation purposes. Some of the animals such as bullocks and donkeys are used to till farm lands and drive farm carts. Donkey cart is the dominant form of transportation in the communities. Both passengers and farm produce are usually transported by donkey carts.

During the community fora and at an interview with the chief of Mognori, it was explained that commercial production of livestock in the communities however started when migrant farmers particularly the Fulani ethnic group from Burkina Faso, Mali and Niger settled in the communities and engaged purely in commercial rearing of livestock. This marked the beginning of commercial livestock rearing in the communities. At this time some indigenous farmers started entrusting their

animals into the care of Fulani Headsmen. Observation from the livestock market shows that cattle, sheep, goats, and guinea fowls are the main commercial livestock produced in the communities.

Interview results from the Bawku Municipal and Bawku West District Directorates of the Ministry of Food and Agriculture (MOFA) revealed that Mognori and Sapeliga communities were prominent markets for livestock in the 1970s. Different kinds of livestock were brought from different parts of the Bawku area and Burkina Faso to the markets. At focus group discussion with livestock farmers in Mognori, they asserted that livestock rearing was very profitable at that time and many people were employed in the marketing process.

Findings from this study, however, show that the two markets have lost their prominence in recent times. The collapse of the market is associated with the closure of the meat factory in Bolgatanga and the establishment of similar livestock markets in Burkina Faso. The Bawku Municipal directorate of MOFA (2006) reported that if the market is revamped it will have the capacity of serving the whole Northern sector. The implication, therefore, is that many people, especially the youth would be employed in livestock rearing and marketing instead of migrating to southern Ghana in search for non existing jobs.

One fundamental characteristic of animal rearing in the communities is that animals are reared in the free range system. Animals are only confined or their movement regulated in the rainy season. This practice of animal rearing according to the crop

farmers, is destructive to dry season gardening. At the household interviews and at the focus group discussions, destruction of farms by animals was identified as the main cause of social conflicts between crop farmers and livestock owners particularly the Fulani herdsmen in the communities.

At an interview with a group of Fulani herdsmen in Sapeliga, they stated that crop farmers do not allow enough space for animal movement to the River for water. They also complained that crop farmers have not allowed enough space for animal grazing.

Diseases as well as theft of animals are factors that affect livestock rearing in the communities. At a focus group discussion with farmers in Mognori, they explained that, hitherto, the flourishing livestock market in the community made the veterinary office in the community very effective. Unfortunately, as they stated, the collapse of the market resulted in the ineffectiveness of the veterinary office which hitherto served as the treatment centre for livestock. Livestock farmers also complained of animal theft which has made livestock rearing insecure in the communities.

4.1.4 Fishing and River Transportation along the White Volta River

Fishing and River transportation is also one of the livelihood activities found in the communities. However, as compared to the others such as farming and livestock rearing, very few people, approximately 14.5 percent of the household respondents are engaged in this activity.

Interview results from Fishermen in the communities show that fishing is a traditional activity undertaken along the White Volta River. According to them, simple equipment such as lines-and-hocks, nets and baskets are often used to harvest fish from the River. Traditionally, fishing is an off-farm activity purposely for domestic consumption. However, an interview with some fishermen in Sapeliga and Temonde revealed some level of commercial fishing in the River. The main types of fish harvested are the tilapia and mud fish.

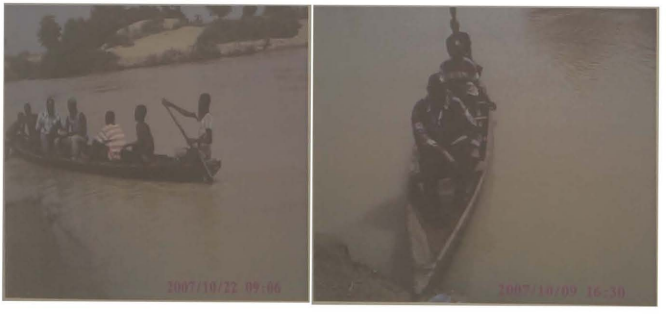
In recent times, fishing has been hindered by the construction of the Bagre dam in Burkina Faso. Fishing was hitherto done in stable waters usually, collected at deeper parts of the River during the dry season. The Bagre dam construction has made the River to flow unceasingly, thereby, making it very difficult for effective fishing. This can be attributed to fishermen lack of capacity and knowledge to undertake fishing in flowing rivers. In similar research conducted by Tsikata, 2005 in the downstream communities of the Akosombo Dam, she noted that fishing in the main river, which in the pre-dam period was a major subsistence activity, went into decline soon after a post-dam boom. She however noted that indeed, some of these impacts are common to downstream communities of large dams the world over (McCully, 1996).

This assertion of fishermen implies that if fishermen's capacities are enhanced, to use modern methods, fishing in the River could be intensified to become a very profitable source of livelihood for many people.

The research found that the new hydrological regime created by the Bagre dam construction, has rather intensified River transportation which, according to the fishermen, was only limited to the rainy season. Due to the fact that fishing has become unproductive in the communities, most of the fishermen have resorted to river transportation as an alternative source of livelihood. In Sapeliga and Timonde for instance, the activity has become very prominent. Observation in Sapeliga and Temonde showed that operators use hand driven canoes to transport passengers, farm produce and among others from one farm location to another or from one community to another for trade and marketing.

In Sapeliga for instance, canoes are used to cross passengers to and from riparian communities in Burkina Faso. According to the operators, proceeds from this business are good and therefore, serves as their main source of employment and income. Averagely, an operator makes a profit of about eight to ten Ghana Cedis daily. Figure 4.2 is a photograph showing the operation of River transportation in the communities.

Fig. 4.2 Photograph of River Transportation in the Communities



By observation, the operation of river transportation in the communities could be dangerous, considering the fact that the canoes used are small and are often overloaded. According to the operator at an interview in Sapeliga, they complained of lack of sufficient capital to acquire larger canoes or better still, engine boats. This therefore, implies that river transportation could be intensified if the capacities of operators are improved. According to the operators, river transportation could assist immensely in the transportation of passengers and farm produce to nearby markets along the River. However, the operators complained of challenges such as siltation which leads to deposition of sand bars in the River thereby making the operations of canoes very difficult. Also, flooding pose serious threat to the operation of canoes. This implies that measure must be put in place to curb soil erosion and siltation in the River.

4.1.5 Sand Winning and Brick molding along the White Volta River

Sand winning and bricks molding are two livelihood activities often undertaken in the riparian communities. Young men are often engaged in loading sand into tipper trucks which are usually, taken to the urban areas for construction purposes. According to the sand loaders, they engage in the activity only in the dry season. This therefore, implies that this source of livelihood is not all year round. In an interview with a group of sand winners in Mognori community they stated that one tipper truck is usually loaded by at least four people at a cost of twenty five Ghana cedis per truck. The group mentioned that each person on a good day may earn an amount of thirty to forty Ghana cedis.

Brick molding is an alternative source of livelihood by most sand winners. The study found that people are engaged in molding bricks along the River for sale. People take advantage of abundant water in the River to mold bricks which they sell for substantial amount of money to supplement their incomes. Averagely, one brick is sold for fifty Ghana peswas. Brick makers claimed in an interview that in a group of four they can make about 500 bricks in a day. This implies that each person can make up to approximately sixty three Ghana cedis in a day. This was considered very profitable, but, very difficult job. The study found that sand winning and brick making is predominant in Mognori community. This is apparent, because the River dries up in the dry season leaving deposits of sand in the River.

According to the Assemblyman of Mognori, in an interview, he lamented, that sand winning could further aggravate the destruction of the White Volta River ecosystem destruction. He therefore, called on the Municipal Assembly to check and regulate the activities of sand winning in the community. The Assembly man was, however, quick to mention that the community had a brick and tiles factory which was in operation in the 1980s. He, therefore, called for revamp of the factory in order to create jobs for the people in the community especially the youth.

4.2 Challenges of Livelihood Activities along the White Volta in the Communities

In the Sustainable Rural Livelihood framework adopted for this study, access to livelihood is usually influenced by the vulnerability context which includes all factors that limit individuals and groups from effectively using a particular source(s)

of livelihood. The study found that the communities encounter different peculiar challenges in the usage of the White Volta River for their livelihood activities.

Drying up of the River resulting in water shortage is a challenge for dry season gardening in some of the riparian communities. Water shortage, which hitherto, affected all riparian communities, is gradually becoming a thing of the past in Sapeliga and Timonde communities apparently because of the Bagre dam in Burkina Faso which provides regular flow of water in the main White Volta River.

In the Mognori community, however, water shortage is considered the most challenge to dry season gardening. According to the farmers at a focus group discussion, it was stated that the River dries up in early parts of the dry season. Gardening is usually undertaken using water drown from shallow dug-out wells. These wells, which are manually constructed, do not contain enough water for extensive gardening.

Another challenge to dry season gardening in all the communities is the destruction of farms by animals. The communities practice the free range system of animal rearing whereby animals are left unguided during the dry season. Most farmers complained of the destructive nature of these animals such as cattle, donkeys, goats, and sheep among others. In Sapeliga for instance, this problem is more pronounced because of the presence of the Fulani herdsmen who are always in conflict with irrigation farmers because of the destruction of farms by their animals. This finding confirms the assertion made by Tonah (2001) that there is unwholesome relationship

between farmers and Fulani herdsmen in the middle Volta Basin. However, unlike in Yeji, in the middle Volta, where Chiefs have been accused of maligning with Fulani herdsmen (Tonah, 2001), the situation in the study communities is different. The Chiefs are joining hands with the farmers to fight the Fulani herdsmen. According to the Chief of Sapeliga in an interview, he lamented that the activities of the Fulani herdsmen destructs farming activities in the community. He therefore called on the District Assembly to assist the community to eradicate the Fulani herdsmen or regulate their activities in the community.

Regular occurrence of ethnic conflict particularly between the Kusasi and the Mamprusi ethnic groups was also mentioned by respondents as a challenge to livelihood activities in the riparian communities. During such conflicts, the communities often abandon their livelihood activities to enable them either effectively engage in the war or for fear of being attacked by enemies in their farms. Farms are often abandon and several livestock stolen. Mosah Ayamba, a 62 years old farmer in Mognori community during an interview stated that the conflict has been with them for several years and is contributing negatively to the development of their communities. He therefore calls on government to come to their aid to resolve the conflict.

Low access to credits as well as poor market for irrigated crops are factors that also limit dry season gardening along the White Volta River. The farmers at focus group discussions stated that most of the banks and other financial institutions often demand collateral securities which many of the farmers lack. A group of farmers in

Timonde during an interview explained their ordeal with some banks. They stated that their attempt to access loans to improve their farms yielded no result apparently because they did not have collateral security. The farmers further stated that the few NGOs that come to their aid give amounts not substantial enough to engage in large scale irrigation.

The poor marketing of irrigated crops was also considered inimical to dry season irrigation. The farmers explained their encounter with market women who often take advantage of their predicament and cheat them by giving very low prices for their crops. The result suggests that there is no formal institution providing adequate assistance to the marketing of irrigation products in the communities.

4.3 Effects of Livelihood Activities on the Sustenance of the White Volta

From the proceeding sections of this chapter, the research findings have shown that several livelihood activities are undertaken along the White Volta in the Communities. These livelihood activities which include rainy season cropping, dry season gardening or irrigation, livestock rearing, fishing and river transportation, and sand winning and brick molding are found to be profitable and therefore contribute immensely to improving the wellbeing of the riparian communities.

However, concerns have been raised about the impact of the livelihood activities on the sustenance of the River resource. According to the White Volta Basin Officer in Bolgatanga at an interview, concerns were raised about the current expansion of agriculture activities along the River. He warned that if the current expansions are

not regulated, sustainable utilisation of the River for livelihood would be threatened in the near future. He therefore, called on Government agencies such as the Ministry of Food and Agriculture and the District Assemblies as well as Civil Society Organisations, to join hands in the fight to protect the River resources.

Studies conducted by the Water Resources Commission, 2004 and the IUCN, 2004 in the White Volta both in Ghana and in Burkina Faso show that since the construction of the Bagré dam in Burkina Faso, small irrigated areas have intensified along the river banks of the Nakambe (White Volta). Both studies note that often these irrigation practices are very inefficient and tend to accelerate erosion and sedimentation in many parts of the River and flood plains leading to infiltration and reduced flow of the River. The studies also note that competition for scarce water and land may contribute to increased poverty and insecurity in the area.

The ensuing chapter, therefore, looks at the management of the White Volta at the communities' level and the contributions of Government and Civil Society Organisations in the management of the River resources for sustainable livelihoods.

CHAPTER FIVE

MANAGEMENT AND PRESERVATION OF THE WHITE VOLTA FOR SUSTAINABLE LIVELIHOOD

5.1 Introduction

Results from the preceding chapter demonstrate that the presence of the White Volta in the communities has created different livelihood strategies in the riparian communities.

Owing to the fact that these livelihood activities contribute immensely to the wellbeing of the people and at same time threaten the sustenance of the River, it is therefore imperative for the management and preservation of the River resources for its sustainability. Of course in contemporary times, River resources management has been proven to be an effective tool for community development, poverty reduction and peace building (Africa Water Journal, 2003).

This chapter, therefore, presents and discusses findings in relation to community level management and preservation of the River as well as the contributions of Governmental and Civil Society Organisations in the management and preservation of the White Volta.

5.2 Community Level Management and Preservation of the White Volta

This section has assessed the customary practices in the communities that have preserved or have the potentials of preserving the River resources.

From the household interviews, all the respondents indicated that there exist customary practices for preserving the River in the communities. Respondents indicated that these customary practices are in the form of taboos that regulate the usage of the River. Respondents mentioned some of the customary practices to include: demarcating areas in river courses for shrines, prohibition of farming very close to the River, and planting of protective grasses along the banks of the River.

It was narrated at the community fora that effective customary laws on river resources management had existed over the years. In the traditional sense, customs and laws on water conservation, pollution control, protection of catchment areas and protection of fisheries are issued by Chiefs and Traditional Priests (Tindana) or Priestesses. The Chiefs and Priests also act as guardians and regulators of water and land resources for, and on behalf of, the gods and ancestors, ensuring the protection and sustainable use of these resources. Participants indicated that customarily, forested areas of the river course are often reserved for shrines, there is prohibition of farming very close to the River, and planting of protective grasses along the banks of the River is often encouraged.

In Sapeliga and Temonde, for instance, it was observed that, forested areas along the course of the River are dotted with shrines for religious purposes. At the community forum in Temonde, Mr Asigre Ayeriga a 62-year farmer said:

'It was forbidden to cut trees or farm close to shrines along the river. Offenders of these taboos were fined or faced the consequences of sickness and or death. The sanctions were scaring enough to deter any body from destroying the River resources'.

In an interview with the Tindanas of Sapeliga and Temonde it was stated that traditionally, planting of protective grasses and trees along the River banks was encouraged and was practiced by most farmers. They further stated that traditionally, it is forbidden to farm close to the River to an extent that one would stand by his or her farm and see the bed of the River. They lamented that these traditional practices were binding and therefore, easier and cheaper practices that checked erosion, siltation and flooding which has the tendency of destroying our farms.

Results from the household interviews shows, however, that most of the respondents (about 95%) do not abide by the customary rules that regulate the usage of the River. Only 5% of the respondents claimed they still abide by customary rules on the River. All the respondents attributed their inability to abide by the customary practices in the communities to the advent of modern religious beliefs (Christianity and Islam) which are not in conformity or are in conflict with the traditional beliefs and practices on river preservation. Respondents claimed that customary beliefs are

associated with spiritual sanctions which modern religious practices do not believe in. As a result most of the people in the communities violate these customary practices which protected and regulated the use of the River hitherto.

Indeed, this result confirms the findings of Opoku-Ankomah et al. (2006) in their research in the Volta Basin. Their report stated that the breakdown of some of the regulatory mechanisms and the undermining of community level institutional arrangements in many rural parts of the basin can be attributed to the advent of colonialism, Christianity and Islam, migration and the introduction of modern technology.

5.3 Activities of Government Agencies in the Management of the White Volta in the Communities

The research found that the activities of some government agencies contribute directly or indirectly to the management of the White Volta in the riparian communities. Table 5.1 shows a catalogue of government agencies and their activities in the riparian communities.

Table 5.1 Support of Government Agencies for the Utilisation and Management of the River Resources for Livelihoods

Government Agencies	Type of Support	% of Respondents Benefiting
Ministry of Agriculture (MOFA)	Provision of Pump Machines to Irrigation Farmers, Fertilizer and Seeds to Farmers	22
District/Municipal Assemblies	Loans to farmers, Emergency Support during Disasters	21
Forest Service Division	Education on River Preservation	13
National Disaster Management Organisation (NADMO)	Emergency Support during Disasters	47

Results from Table 5.1 clearly demonstrate the specific areas of support and interventions of government agencies in the management of the River. Household respondents enumerated the contributions of these agencies to include loans, supply of pump machines, fertilizer and seeds on credit, giving emergency support to victims of disasters and giving education on protection of the River. It was stated that these services are very crucial for effective utilisation and management of the River resources.

As indicated in table 5.1, about 21% of the respondents affirmed that they received support in the form of reliefs during disasters as well as loans from the District and

Municipal Assemblies. Respondents stated that relief items such as food, mattresses, and blankets among others, are often given to the communities during floods. Respondents also stated that they receive support in the form of loans from the Assemblies to support their farming activities.

The amount of loan received by each farmer depends on his or her ability to repay. This implies that access to such credit largely depends on the collateral that the farmer can produce. Indeed, this is considered a limitation of the Assemblies loan scheme since most farmers complain of not having collaterals. This may largely explain why only 21% of the respondents benefit from the Assemblies.

During the community fora, participants complained that support from the assemblies is often meager and not regular. A participant at a community forum in Timonde community lamented that;

The Assemblies claim they have loans to support people in the communities meanwhile, it takes hell of a time to access it.

Response from community fora also reveal that the Assemblies are not doing any thing worth commending in the areas of education on protection of the River. This response implies that the Assemblies might not have specific objectives for assisting riparian communities to maximize the potentials of the White Volta River to reduce poverty in the area.

Indeed, at separate meetings with the two Assemblies, responses indicate that no structures have been put in place to specifically manage and preserve the resources of the White Volta River. Even though both Assemblies are representatives of the International Transboundary Management Structures of the White Volta Basin, their contribution at the local community level was found to be nearly non-existing.

Considering the contribution of the White Volta River to livelihoods in the communities, it would be very appropriate for the Assemblies to design specific structures to support the riparian communities expand their livelihood activities along the River so as to reduce unemployment and poverty in the communities.

The Forest Service Division of the Forestry Commission has also been working for the preservation of the River resources in the riparian communities. As indicated in Table 5.1, only 13% of the respondents affirmed their benefit in the form of education on the River resources protection and preservation. At a meeting with the Chief, Elders and the Assemblyman of Timonde community, it was stated that officials of the Forest Service Division of the Forestry Commission occasionally come to educate the community on preservation of the River resources. They however stated that this is not on a regular basis.

Outcomes from interview with the Bawku Municipal Forest Service Division show that the outfit had no specific project (with funds) for the management and preservation of forest cover along the River. Even though, the Division admitted that

preservation of the River is its responsibility, the outfit had no funds to undertake serious regulatory measures to preserve the Resource.

From table 5.1, the National Disaster Management Organisation (NADMO) of Ghana is one of the government agencies that operate in the riparian communities. According to the respondents, NADMO supports the communities during natural disasters such as floods, famine among others. At a community forum in Sapeliga, participants recollected the support they received from NADMO during the recent floods that occurred in July/August, 2007. Some of the participants claimed they were given support in the form of food, seeds, and blankets, among others. Most of the participants, however, stated that the support from NADMO is often meager to alleviate their predicaments.

Results from the household interviews, focus group discussion and community fora in the three communities show that the Municipal and District Directorates of the Ministry of Food and Agriculture (MOFA) are assisting livelihood activities in the riparian communities. About 22% of the respondents claim they benefit variously from the Ministry. The results show that the Ministry has been working closely with farmers, giving them assistance in the form of seeds, fertilizer and pump machines to improve their farming activities along the River. The farmers stated that seeds, fertilizer as well as pump machines are often given to them on credit. These credits, however, are not giving to individual farmers but groups which membership must include both sexes. Of course, gender balanced development is and must be the

current trend in development because of the enormous potentials embedded in the female sex in particular.

At the Regional level of MOFA, the 2006 annual report show that Upper East Regional Directorate in 2005 conducted a successful field trial of irrigating maize as a third crop along the White Volta. The average yield was 3.7 tons per ha, compared to a national average of 2.5 tons and a regional average of less than 1.2 tons.

The plan is to plant one vegetable crop and maize during the dry season, and one cereal crop during the rainy season. To avoid siltation, the cultivation should be located at a distance of 100 metres from the River bank. The water is pumped out of the White Volta from this distance, and then gravity irrigation is used to irrigate the fields, taking advantage of the sloping landscape. The 100 metre stripe should be planted with economic trees such as cashew and mango to provide income. It was further stated that where the area is not deforested yet, the forest would be protected.

However, at the local communities' level, the research found that MOFA is not engaged in any education for the preservation of the River resources. Indeed, this might be very dangerous because credit to expand irrigation without education on the River protection could further aggravate the situation of the River which current state is being described as threatened by ongoing farming activities.

The White Volta Basin Project under the Water Resources Commission is a major stride by the Government of Ghana towards the management of the White Volta River resources for sustainable livelihoods. However, at the local riparian level it

was found that the communities are not aware of the presence and contributions of the Agency in the management of the River resources. In an interview with the Basin Officer at Bolgatanga, the Upper East Regional capital, he explained that the White Volta Basin Project is the second among five planned pilot projects of the Water Resources Commission to initiate Integrated Water Resources Management (IWRM) in Ghana.

The Project is a decentralized initiative to implement IWRM and develop a Basin Management Plan for the White Volta Basin, which will serve as an impetus for the development of a National Water Plan. The Project is implemented by the Ghana Water Resources Commission and the GLOWA-Volta Research Project (GVP) of the Center for Development Research (ZEF) of the University of Bonn, Germany. The project is also supported by the Danish International Development Agency (DANIDA), the Canadian International Development Agency (CIDA), the World Bank and the Government of Ghana.

According to the Basin Officer in an interview, it was stated that the White Volta Basin Project has a series of activities. The Project has identified the major stakeholders in the Basin and awareness creation on IWRM would begin in the riparian communities. To effectively implement the objectives of the Project, a Basin Board (White Volta Basin Board) has been constituted consisting of stakeholders from government agencies, district authorities, water institutions, traditional authorities, NGOs and water users.

According to the Basin Officer, the main output of the Project is to arrive at a Decision Support System. The system is holistic and will reflect a "bottom-up" strategy whereby the needs and aspirations of the local riparian communities will be represented. Indeed, the formation of the White Volta Basin office is a step in the right direction since such an outfit will enhance the efficient and judicious use of the River resources for sustainable livelihoods and therefore, reduce poverty in the riparian communities. It will, therefore, be imperative for government and Civil Society Organisations to join hands with the GLOWA Project to support the White Volta Basin Project to achieve its noble objectives.

At the International Transboundary level, the White Volta Basin will work closely with the Volta Basin Authority which is a joint declaration of the Ministries of Water resources of the riparian States (Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali and Togo) to improve the water governance of the Volta.

5.4 Activities of Civil Society Organisations in the Management of the White Volta Basin

The study has found that very few civil society organisations are working specifically for the management of the White Volta in the communities.

5.4.1 The GLOWA Volta Project

The GLOWA Volta Project (GVP) is a Non Governmental Research Project that is aimed at strengthening the governance of the entire Volta Basin Resources.

In a series of interviews with the GLOWA Volta Project (GVP) coordinating units in Ghana and Burkina Faso, it was explained that the GVP is an interdisciplinary project led by the Center for Development Research at the University of Bonn. The project aims to support sustainable water resource management in the Volta Basin. The main thrust is the development of a scientifically sound Decision Support System (DSS) that will help authorities and other actors in the water sector in Ghana, Burkina Faso and other riparian countries to optimize water allocation within the basin.

The central objective of the GVP is the analysis of the physical and socioeconomic determinants of the hydrological cycle in the Volta Basin in the face of global climate change. The overall time-frame envisaged is nine years (2000–2009). The project has just entered its third phase. The project is part of the larger GLOWA Program financed by the Federal Ministry of Education and Research with additional funding from the Ministry of Science and Research of North Rhine–Westphalia.

The International Water Management Institute (IWMI), an international scientific institute is also collaborating with the GLOWA Volta Project to carry out the Challenge Program on Food and Water. The main objective of the project is to adopt local approaches to transboundary water management of the basin.

The Global Water Partnership and West Africa Water Partnership are also collaborating with the GVP for the governance of the White Volta Basin. The GWP-West Africa is said to have facilitated the meeting in January of the Ghana–Burkina

Joint Technical Committee on IWRM. In July 2002, GWP/WAWP organized and facilitated the constitutive general assembly of the African Network of River Basin Organisations (ANBO).

The study however found that the activities of these Organisations do not reflect at the riparian communities' level where the livelihood of the people is largely dependent on the River resources. During the household interviews none of the respondent mentioned any of these organisations to be present in the communities for the management and preservation of the River.

5.4.2 The PAGEV Project

One remarkable contribution of Civil Society Organisations to the management and preservation of the White Volta resources for sustainable livelihood has been the establishment of the Project for Improving Water Governance (PAGEV) in the White Volta Basin between Ghana and Burkina Faso. The Project for Improving Water Governance in the Volta River Basin, with French acronym- PAGEV *(Projet d'Amélioration de la Gouvernance de l'Eau dans le bassin de la Volta)* is pioneering project in the White Volta basin for the restoration and protection of the River's ecosystem..

The Project is a joint initiative of the West Africa Office of the World Conservation Union (IUCN-BRAO) and the West African Water Partners (GWP-WAWP) in partnership with Ghana's Water Resources Commission (WRC) and Burkina's Directorate General for Water Resources (DGRE). The project commenced with a

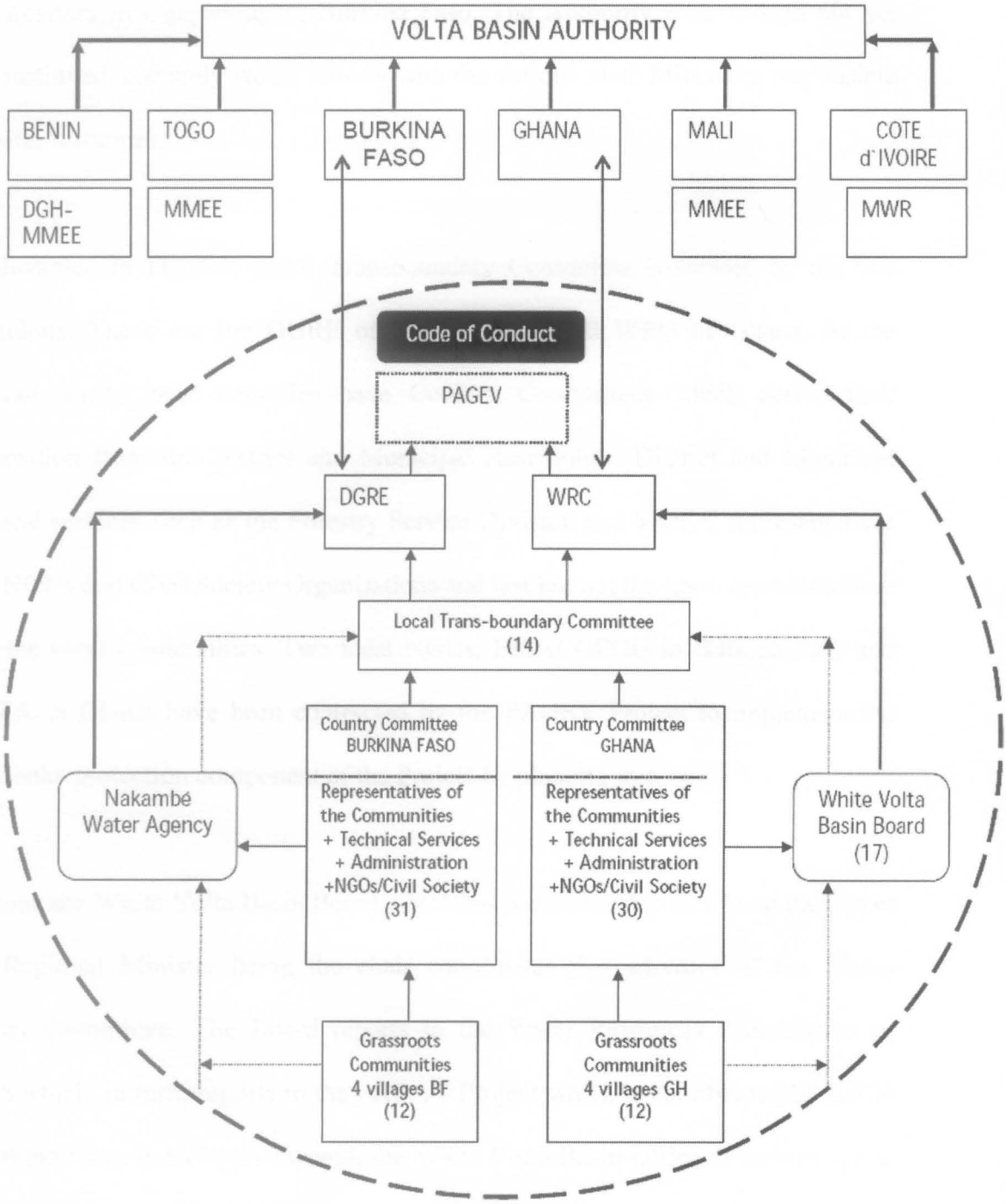
series of studies on water resources led by the DGIRH and the WRC, on the basis of which the joint management options of the water resources in the basin were defined. Pilot project interventions, in collaboration with the communities on the two sides of the border, have also been in place within the pilot zone in the White Volta Basin. The project is financed by the Directorate General for International Cooperation (DGIS) – the Dutch cooperation agency and the Swedish International Development Agency (SIDA/ASDI).

This international initiative seeks to demonstrate how to use the ecosystem approach into river basin planning and management. The Project has its main objective of Improving Water Governance in the Volta River Basin and to develop a code of conduct or principles for water governance for the joint management of the Volta Basin. The three-year project is targeting the White Volta River Basin, and focusing more specifically on Burkina Faso and Ghana where 85% of the basin surface area is located.

The Project seeks to strengthen the bilateral cooperation between Burkina Faso and Ghana towards a more equitable and sustainable management of the Volta Basin. It is being implemented on a pilot basis covering an area of 2,700 km spreading from the downstream of the Bagre Dam in Burkina Faso to the Garu-Tempane District in Ghana. This pilot zone spans the frontier of the two countries. In Burkina Faso, the zone of intervention covers communities lying close to the Nakambe (White Volta) in Zabre and Bittou Departments in the Boulgou Province. These include Beleyerla, Zekeze, Sampema and Mognore. Those from the Ghana side include Sapeliga and

Sakom in the Bawku West District, Mognori in the Bawku Municipality, and Kugrasia in the Garu-Tempane District of the Upper East Region of Ghana. Fig 5.1 shows the operational structure of the PAGEV Project.

Figure 1: Chart of the Transboundary and National Committee for the Management of the White Volta Basin and the Nakambé



Source: IUCN (2006)

At the top of the chart in Fig 5.1 is the Volta Basin Authority which comprises the six riparian countries. The authority is yet to be fully instituted; however, it has its head quarters in Ouagadougou, Burkina Faso. The Authority even though not yet fully instituted, currently works closely with the various State Ministries responsible for water resources.

As illustrated in Fig 5.1, Local Transboundary Committee is formed by the two institutions. These are the DGRE of Burkina Faso and WRC of Ghana. At the National levels, both countries have Country Committees which derive their composition from the District and Municipal Assemblies, District and Municipal technical services such as the Forestry Service Division and MOFA, representatives from NGOs and Civil Society Organisations and last but not the least, representatives from the local communities. Two local NGOs, BISACOPOU in Burkina Faso and ZOVFA in Ghana have been contracted by the PAGEV Project to implement the river banks protection component of the Project by planting tree.

In Ghana the White Volta Basin Board which has a membership of 17 and the Upper East Regional Minister being the chair coordinates the activities of the Ghana Country Committee. The Board reports to the Water Resources Commission of Ghana which, in turn, reports to the PAGAV Project which is coordinated by IUCN in Burkina Faso. In an interview with the White Volta Basin Office in Bolgatanga, it was explained that the out fit under the pilot IWRM (Integrated Water Resources Management) component has started interventions with the local communities to establish transboundary cooperation. Interventions being carried out include the

formation of local, national and transboundary water committees; reforestation of the river banks, rehabilitation of reservoirs; and joint monitoring of water quality and flow into Ghana.

In Sapeliga and Mognori communities, the study has found that the local transboundary committees have been constituted with membership of five including two women. The Assemblymen were compulsory members of the Committees. The main objectives of the Committee in the communities are for awareness creation on the need to protect the River resources and information sharing with their counterpart riparian communities in Burkina Faso.

In an interview with the local transboundary committees in Sapeliga and Mognori communities, members stated that the committees have been working effectively since they were constituted in 2006. The committees have been engaged in educating farmers on the need to protect the River by discouraging farming very close to the River bank and cutting trees along the River. The committees have also been meeting with their counterpart in Burkina Faso to share their experiences and also resolve conflict arising from their common use of the River resources.

The committees, however, complained of the lack of logistics such as bicycles to enable them effectively move round the communities to carry out their duties. The committees also complained of lack of incentives such as allowance to serve as motivation for them to work effectively.

In an interview with the committee in Sapeliga it was stated that the committee's activities is becoming dormant because the Country Committee has not been effective because of frequent change of leadership. In deed, the chairman of the Ghana Country Committee that is the Upper Regional Minister has had three successive changes since the year 2000. In interviews with some members of the country committee from the Bawku Municipal and Bawku West District Assemblies, the District and Municipal Directorates of MOFA, and the Bawku Municipal Forest Service Division of the Forestry Commission, it was stated that the country committee has not been working effectively. It was stated that the committee does not meet frequently to address current issues arising the usage of the White Volta.

It was therefore recommended by members of the Committee that effective structures should be put in place with funds to implement the objectives of the Committee especially at the communities' levels.

5.4.3 Activities of ZOVFA in the Implementation of the PAGEV Project

At the Bawku side of the White Volta, ZOVFA (Zuuri Organic Farmers Association) a Non Governmental Organisation has been contracted by the Water Resources Commission and the IUCN to implement the PAGEV Project in four selected communities. These communities include Sapeliga and Sakom in the Bawku West District, Mognori in the Bawku Municipality, and Kugrasia in the Garu-Tempane District of the Upper East Region of Ghana.

The main objectives of ZOVFA for the implementation of the Project include the following:

1. Communities along the White Volta River basin become aware and sensitized on the importance of good water governance and develop a continuing interest to do things that will have a positive impact on their livelihoods and the basin resource management.
2. Resource users along the River Basin undertake more sustainable, regenerative methods of farming, fishing, wood harvesting, herding and other land use practices that will serve to conserve the resources for future generations.
3. Communities develop acceptable and equitable systems of access, use and control of the small dam site and river basin resources by all sectors of the community, particularly women, and the poor, disabled and migrant population.
4. Communities stop or minimize water polluting activities of actors along the river bank.
5. Contribute to building a comprehensive database of useful information on the White Volta basin in the areas covered by the pilot communities.
6. Strengthen the institutional capacity of ZOVFA to provide effective support to the project.

At the beginning of the Project in 2006 the first activity had been community sensitization and mobilization in the form of seminars and durbars mainly to improve participation and a sense of community ownership of the project and for women and

the youth involvement. The durbars were also used to enact local bye-laws for the protection of the River banks.

According to the ZOVFA Project Officer in charge of the River banks protection project in an interview, he affirmed that with assistance from the opinion leaders, individual farmers and group, buffer zones demarcation along the River have been created for the planting of protective trees. These trees which are to be owned and managed by the local farmers are of different species including fruit trees such as grafted mangoes and cashew as well as wood locks for the purpose of fire wood for domestic use. The communities have been educated, trained and supported to establish and manage tree nurseries. Table 5.2 is statistics of Tree Seedlings raised in the four operational communities of ZOVFA.

Table 5.2 Statistics of Tree Seedlings Raised in the Four Communities

Community	Type Seedling			
	Cassia	Parkinsonia	Mahogany	Mango
Sapeliga	390	1008	186	315
Mognori	220	900	530	830
Kugashia	142	600	-	-
Sakom	331	-	18	-
Total	**1083**	**2,500**	**734**	**1,145**

Source: ZOVFA, July 2008

At Sapeliga and Mognori communities, the Project has planted a number of protective trees along the River. The first 20 metres from the River is planted with wood locks apparently for the purpose of domestic use. Of course, domestic wood needs are major causes of deforestation along the River. Grafted mangoes and other economic trees are also planted in the buffer zone at a distance of about 40 metres away from the River banks. The purpose of these economic trees is to give farmers alternative livelihood so as to avoid cultivating in the buffer zone. Table 5.3 shows the number of surviving trees along the River since the inception of the project in 2006.

Table 5.3: Number of Trees Surviving Along the River Banks

Community	Type of Trees	
	Cassia/Parkisonia	Grafted Mango
Mognori	550	381
Sapeliga	784	220
Kugrashia	5	152
Sakom	-	-
Total	**1,339**	**753**

Source: ZOVFA, June 2008

According to ZOVFA June 2008 report, most of the trees were washed away by flood waters. More so, the tribal conflict which started at the beginning of the year made it difficult for farmers to visit their farms, therefore, most of the trees were

destroyed by animals. Nevertheless, as shown in Table 5.2 a good number of trees are surviving along the River.

The photographs in fig. 5.2 show some of the surviving protected trees planted by ZOVFA in Mognori and Sapeliga.

Fig. 5.2 Photographs Showing Protective Trees Planted by ZOVFA/PAGEV

A number of capacity building and training programmes are being organized in the communities to equip the farmers with skills necessary for grafting mangoes and the management of nurseries and trees planted along the River. In order for the farmers to have proximity to water the trees and for farmers to have water to irrigate lands at a distances of about 50 metres away from the River banks, the project has started constructing wells located about 50 metres away from the River banks. So far, three wells have been constructed along the River in Mognori community.

For the communities to adhere to the 50 metres buffer zone no-farming bye-law and for farmers to appreciate the project, a number of alternative livelihoods have been given to the communities. Credit facilities have been given to farmers to enable them farm at the 50 metres limit. The credits are in the form of cash and pumping machines. In deed, this strategy was found laudable because most farmers complained of insufficient capital to farm at the 50 metres limit as prescribed by the PAGEV project. According to ZOVFA progress report for June 2008, more pumping machines have been received from PAGEV to support dry season gardening in the communities.

More so, bee hives have been provided by ZOVFA to some farmers in the Mognori community for bee keeping as an alternative livelihood so as to improve the income of the riparian communities. ZOVFA is also providing farmers especially women with ruminants to enhance their livestock rearing in the communities. So far, 16 farmers (12 women and 4 men) from all the communities have been provided with 32 goats. The reason for including more women than men is to bring more women on board in livestock production which will contribute to an increase in their wealth and thereby contribute to improving the communities' welfare. Fig. 5.3 is a photograph showing some beneficiaries of the project.

Fig. 5.3 Photograph of Women beneficiaries of the project

The operation of ZOVFA is faced with a number of challenges in the communities. The recent flood in August 2007 affected a number of trees planted along the River. The biggest challenge for the project was the ethnic crises in the Bawku municipality, which made it impossible for ZOVFA's staff and technical services team to freely move in the communities. It has been realized that development activities in the Bawku Municipality have slowed down due to the recurring ethnic conflicts in the area. Government needs to take a second look at the situation and put in place more effective measures to bring lasting peace to the area.

Of course the land tenure system in the area is also a challenge for the project. Most farmers who have shown interest in the project do not own land near the River. Customarily, trees on any parcel of land belong to the landlord. Therefore, interested farmers in the project have the fear of ownership of the trees if they go ahead to plant them. Another fear in the communities is that their lands would be permanently

taken by government; as a result some farmers are finding it difficult to be convinced about the benefits of the project.

Despite these challenges, the Project is ongoing with plans to expand to other communities. It is envisaged that if the project is expanded to other communities, the sustenance of the White Volta will be assured and livelihood activities along the River will be sustainable in the riparian communities. However, considering the mix reactions from the communities concerning the implementation of the project, it would be appropriate and easier if customary systems on the protection of the River are integrated with the current byelaws proposed by the Project.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter gives summary of the major findings of the research and also draws conclusion for the study by giving the way forward for efficient utilisation, preservation and management of the River for sustainable livelihoods in the riparian communities. The chapter has also given recommendations for efficient utilisation, preservation and management of the White Volta River for sustainable livelihood.

6.2 Summary of Major Findings

The research was conducted to assess how riparian communities of the White Volta River in the Bawku area are using and preserving the Basin resources for their livelihood and how Government and Civil Society Organisations are assisting in the preservation and management of the River resources for sustainable utilisation.

Using cross sectional data collected from households, the River user groups, opinion leaders, government agencies and civil society organisations, the study came out with the following findings.

The study found that riparian communities in the Bawku area are using the White Volta for several livelihood activities. These include rainy season cropping along the River, dry season gardening, livestock rearing, fishing and river transportation, and sand winning and bricks molding.

The study results show that rainy season cropping which is the dominant livelihood activity in the riparian communities is more productive along the River. Crops cultivated along the White Volta River in the rainy season gives better yields than those cultivated at a distance away from the River. The study, however, found that flooding is the main challenge to cropping along the River in the rainy season.

The study has also found that dry season gardening along the River, even though a traditional activity, has become intensified in recent times employing about 71.8% of the household respondents. The expansion of dry season gardening along the River is in response to low yields from rain-fed cropping. Different kinds of vegetable crops such as onion, water melon, pepper, tomatoes and among others as well as some cereal crops such rice, maize and sorghum are cultivated in commercial quantities in the dry season along the River.

Factors such as water shortage in some parts of the River hinders dry season gardening in the riparian communities. More so, destruction by animals and low capacity of farmers to buy inputs and pump machines to draw water from the River makes farmers rely on the traditional methods of gardening such as bucket irrigation. The study has found that the construction of the Bagre Dam in 1993 in Burkina Faso has created a new hydraulic regime whereby the River flows continuously in the main White Volta. This has ameliorated water shortage in the main White Volta. However, communities located on the tributaries such as Mognori is still challenged with water shortage in the dry season.

Livestock rearing is an important source of livelihood for almost every household in the riparian communities. The presence of the River provides abundant water and pasture for the rearing of animals such as cattle, sheep, and goats, among others. Farmers rely on animals as their immediate sources of income. Animal waste also provides manure for farms whilst some animals such as bullock and donkeys are used to assist in the farming process and transportation.

The ideal environment for animal rearing in the riparian communities has attracted migrant nomads predominantly the Fulani herdsmen whose presence has been blamed for the destruction of farms by animals. This often results in social conflicts between crop farmers and the Fulani herdsmen.

The study also found that fishing and river transportation along the River is a source of employment and income for some inhabitants. Fishing which was hitherto conducted in stable waters collected at locations when the volume of water in the River reduces drastically has become dormant in recent times since the construction of the Bagre Dam in Burkina Faso in 1993. The construction of the Dam makes the River to flow continuously all year round. This makes it difficult for most fishermen to engage in fishing because they do not have the capacity to use modern methods of fishing in flowing rivers.

The new hydraulic regime has rather made river transportation a flourishing livelihood activity in the riparian communities especially in Sapeliga and Temonde communities. The use of hand driving canoe to convey goods as well as passengers

from community to community and across to and from Burkina Faso, has become a major alternative source of employment and income for the fishermen whose fishing activity has been hampered by the construction of the Bagre Dam.

The study also found that sand winning and bricks molding along the River are sources of livelihood for some inhabitants along the White Volta. Study however found that relatively few people about 14.5 of the household respondents are engaged in these activities for a living.

The study has generally found that the riparian communities' engagement in livelihood activities along the River enhances their wellbeing in terms of Food security and improved income.

The study found that frequent occurrence of ethnic conflict in the Bawku area makes it difficult for the riparian communities to effectively utilize the River for their livelihood.

The study has, however, found that the nature of some of the livelihood activities along the River is posing a threat to the sustenance of the River. Some of these threats are siltation in the River resulting from bad farming practices along the River. This leads to water shortage and floods in the River.

The study also found that different strategies are employed for the management and preservation of the White Volta for sustainable livelihood in the communities. For

the preservation of the River, the study found that there are customary practices and beliefs in the communities that preserved the River resources in the past. Even though some of these practices exist in contemporary times, most of them are eroding largely due to the advent of modern religious practices whose believes are in contradiction with customary beliefs.

Nevertheless, National and International Civil Society Organisations interest is found to be growing towards the management and preservation of the White Volta. The research also found that government agencies contribute variously in assisting the riparian communities to derive maximum benefits from the resources of the River. Government agencies such as MOFA, the Municipal and District Assemblies, Water Resources Commission, Forestry Commission and the National Disaster Management Organisation are giving supports in the form of loans, fertilizer, pump machines, emergency reliefs and education on river protection to the communities.

Civil Society Organisations and international research institutions such as the GLOWA Volta Project, the IUCN are working in collaboration with the Water Resources Commission of Ghana and the Directorate General for Water Resources (DGRE) in Burkina Faso to implement a Project for improving Water Governance (PAGEV) and preserving the ecosystem of the White Volta Basin. The project is implemented by two local NGOs, ZOVFA in Ghana and BISACOPOU in Burkina Faso. These NGOs operate at the riparian communities' level to sensitize people on the need to preserve the River resources via tree planting along the River banks.

6.3 Conclusion and the Way Forward

In conclusion, it must be stated that the presence of the White Volta River in the riparian communities is a blessing. The findings have demonstrated that most inhabitants in the riparian communities depend largely on the River resources for their livelihood. This therefore, implies that the sustenance of the River resources is very crucial for the development of the communities. Therefore improved White Volta resources management and preservation is one of the keys to producing enough food to alleviate the suffering of many people in the riparian communities today and the future.

However the widespread scarcity, gradual destruction and aggravated pollution of water resources in the entire Volta basin along with the progressive encroachment of incompatible livelihood activities, demand integrated river resource planning and management with much participation of local people and Civil Society Organisations.

6.4 Recommendations for Efficient Utilisation and Preservation of the White Volta River

- The research findings demonstrate that there are several livelihood activities taking place along the White Volta in the Bawku area. It is therefore, recommended that any policy and planning for the development of the Bawku area should consider enhancing these activities and also regulating their operations to ensure sustenance of the River resources.

- Frequent occurrence of floods along the White Volta River is a challenge to rainy season cropping. Measures should, therefore, be put in place to mitigate the effects and reduce the frequency of flood occurrence. There should be timely and effective flow of information to the riparian communities about the opening of the Bagre Dam since that will allow the communities to prepare for any effect of the flood. Local communication systems such as house to house announcements in the night which is a traditional form of communication in the communities could be use for disseminating flood information.

- It is recommended that irrigation dams are build in the communities to regulate floods in the River and also to provide enough water for irrigation and other related activities
- To forestall the destruction of farms by animals, it is recommended that corridors should be provided to regulate the movement of animals to and from the River. Measures must also be taken to resolve conflicts between Fulani herdsmen and farmers in the communities.

- Since livelihood activities are directly dependent on the River resources, it is strongly recommended that measures be put in place to prevent the destruction of the River resources by recalcitrant users, who might take advantage of the lack of effective regulations and misuse the River resources for short term gains. The creation of buffer zones and institutionalization of

enforceable laws to regulate livelihood activities along the River is highly recommended.

- It is also recommended that the PAGEV Project being implemented by ZOVFA in some of the riparian communities be extended to other riparian communities such as Timonde where a lot of livelihood activities are taking place along the River.

- It is further recommended that the growing transboundary negotiations among the riparian countries must consider the cooperation of local riparian communities. Without the integration of local stakeholders and actors, regulation principles might be passed but the local people would not abide by them.

- It is also recommended that the Bawku Municipal and Bawku West District Assemblies and other government agencies located in the area should design specific projects purposely for the management and preservation of the River.
- It is highly recommended that the recurring ethnic conflict in the area be resolved amicably to allow the inhabitants freely undertake their livelihood activities along the River.
- Last but not least, the study recommend that further research be conducted in the area to ascertain the findings of this study and also to find alternative strategies for harmonizing the use of the White Volta for livelihood and preserving it for sustainability.

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APPENDICES

Appendix 1

HOUSEHOLD QUESTIONNAIRE

Introduction:

This study is being conducted by Asaah S. Mohammed an M. Phil. Student in Social Work, University of Ghana.

I appeal to you to answer the following questions as candidly as possible. Where alternatives have been provided, please circle the code number only. For other questions write your answer in the space provided.

I will ensure confidentiality of your answers.

Thank you in advance for your cooperation.

Date of interview ..... Q.No. .....

Name of Community .....

SECTION A

Personal/Demographic Data

1. Sex of respondent: M [ ] F [ ] Age: _____
2. Ethnicity.....
3. Current marital status of respondent: Never Married [ ] Married [ ] Divorced [ ] Separate [ ] Widow [ ]
4. Number of children.....
5. How many are in school? .....

6. Level of literacy/education attained:

(1). Never schooled [ ] (2). Primary school [ ] (3). Middle school [ ]

(4). Secondary/Technical school [ ] (5). Commercial/Vocational[ ]

(6). Teacher training [ ] (7). Tertiary [ ]

(8). Other, specify _____

7. Main occupation

1. Farming
2. Fishing
3. Animal rearing
4. Trading
5. Formal employment, Specify

.....

SECTION B

Livelihood Activities along the White Volta in the Communities

8. What are the uses of the river resources in your community?.....

9. Which of the activities are you engaged for a living?.....

.....

10. What are the benefits of the River resources to each of the activities mentioned above?.....

.....

11. At what level do you engaged in any of the above mentioned activities?

1. Subsistent level 2. Commercial level 3. Both

12. What challenges do you face in using the River resources for each of the activities mentioned above?.....

13 What copying strategies do you employ to mitigate the challenges?.....

.....

Contributions of the River resources to Livelihood

14. What do you do for a living in the community.....

15. What is your annual income .....

16. What is your main source of income .....

17. How much do you spend daily on your household? .....

18. In general, how do you or your household benefit from the River resources in the following ways?

Food Security

.....

Employment and Income generation.....

.....

19. What other benefits do you or your household derives from the River for your livelihood?.....

SECTION B

Customary Management of the River resources in the Communities

20. Customarily, do you have any system for the management of the River in your community? ( ) Yes ( ) No

21. If yes, name and explain some of them.....

.....

22. If no, why are you not having any river management systems in your community? .....

.....

23. Do you think it is necessary to have any local system for managing the River?

1. Yes 2. No

24. If yes, why .....

25. If no, why .....

26. Customarily, how does one get access to the River resources and land for any activity? .....

27. Do women in your community traditionally have access to use the River/land resources? ( ) Yes ( ) No

28. If no, what perceptions exist in the communities concerning women usage of the River's resources? .....

SECTION C

Contributions of Civil Society and Governmental agencies in the Management of the River resource in the communities

Contributions of Governmental agencies

29. Presently which Government agencies are involved in the management of the River in your community?.....

30. What activities do they engage in? .....

.....

31. Do they often involve the community members in taking decisions on the above interventions? Yes ( ) No ( )

32. If they do not, what reasons do they give for non involvement?.....

.....

33. How do you think their interventions are very helpful in the management of the River?.....

34. Were there any previous interventions by any government agency in the past?

Yes ( ) No ( )

35. If they did exist, give their names and what they where doing in relation to the management of the River in your community? .....

.....

36. When did they leave the community and why they left?.....

.....

37. Does the community still practice or use the services provided by these agencies? Yes ( ) No ( )

38. If no, give reasons why the community has stopped using those services

.....

Contributions of Civil Society

39. Are you aware of any Civil Society Organisation working for the management of the River in your community? ( ) Yes ( ) No

40. If Yes, name them and state their specific activities

.....

41. Do you or any member of your household benefit from the activities of these Civil Society Organisations? ( ) Yes ( ) No

42. If Yes, specify the benefits you or your household members derive from these organisations.....

.....

43. Do you think the activities of these organisations are enough for the management of the River? ( ) Yes ( ) No

44. If No explain why.....

.....

Recommendations for Improving Community Utilization and management of the River

45. In your view how do you think your community can use the resources of the river for livelihood and at the same time maintain it for the future?

.....

.....

.....

46. What recommendations would you give to NGOs and Government agencies that have interest in the management of the River in your community?

.....

.....

.....

THANK YOU VERY MUCH

Appendix 2

INTERVIEW GUIDE FOR INSTITUTIONS (NGOS & GOV. AGENCIES) WORKING IN THE MANAGEMENT OF THE RIVER

1. What inform your organisation's decision to intervene in the management of the river resources in the communities?

2. What activities does your organization carry out in the communities in terms of the river resources management?

3. Does your organization involve the community members in taking decisions on the above and other activities? Yes ( ) No ( )

6. How are the communities responding to your interventions?

7. Does your organization collaborate with any other organization in assisting the communities in the management of the River? If yes, specify their names and the areas you collaborate.

8. What are the views or concerns of your organization on the Bagre dam construction?

9. What measures does your organization think can help the communities to use the resources of the River and at the same time maintain it for sustainability?

Appendix 3

SPECIAL INTERVIEW GUIDE FOR ZOVFA

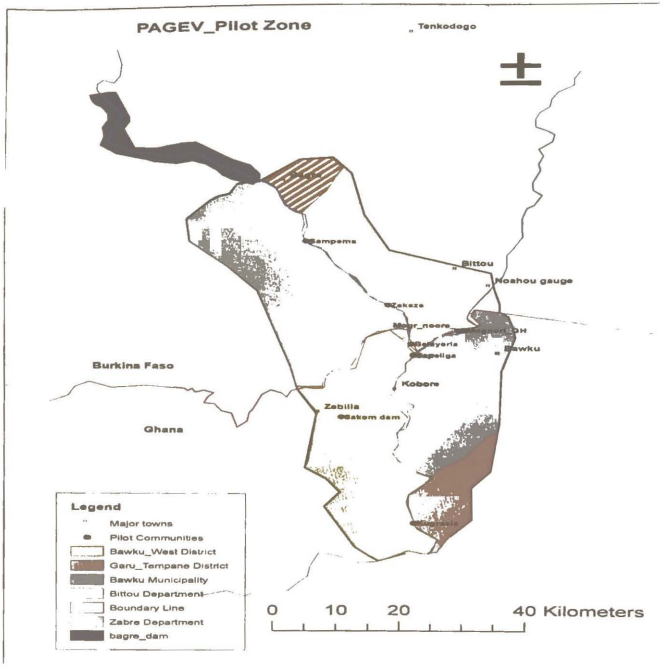
1. When and how was ZOVFA established?
2. What is the purpose and mission of ZOVFA?
3. What are the objectives of ZOVFA?
4. Where are the sources of funding for ZOVFA?
5. Number of staff and management structure of ZOVFA
6. When did ZOVFA enter into the management of the river/land in the area?
7. What factors influenced ZOVFA move into the River/land management in the area?
8. Which communities are currently benefiting from ZOVFA intervention?
9. How long is ZOVFA going to work in the communities
10. Name the activity areas of ZOVFA intervention and explain in detail how each of the activities is carried out in the communities.
11. What is the state of each activity in the communities?
12. How is ZOVFA working with the communities in terms of mobilization, participation in decision making, implementation process etc?
13. What are the responses from the communities?
14. Does ZOVFA work in any of the communities in collaboration with any organization? If yes, name them and explain how ZOVFA collaborates with those organizations.

15. Is ZOVFA currently implementing any project that other organizations are also implementing in the same communities? If yes, which organisations are these?
16. If yes, has ZOVFA in any case come into conflict with such organizations?
17. If yes, how has the conflict affected ZOVFA as an organization and ZOVFA's work in the communities?
18. Will ZOVFA expand its operations to include more communities in the future? If yes, which communities?
19. What is ZOVFA view about the construction of the Bagre dam in Burkina Faso?
20. What factors does ZOVFA belief to be the causes of water shortage in the River?
21. Is ZOVFA a member of the transboundary committee?
22. What is role of ZOVFA in the committee?

    Does ZOVFA work in collaboration with and organisation in Burkina Faso. If yes, which organisations are these?
23. How and what areas does ZOVFA collaborate with those organisations?
24. In general, what other issues or concerns that ZOVFA would like to address or is addressing towards the utilisation and management of the River/land for community development?

Appendix 4

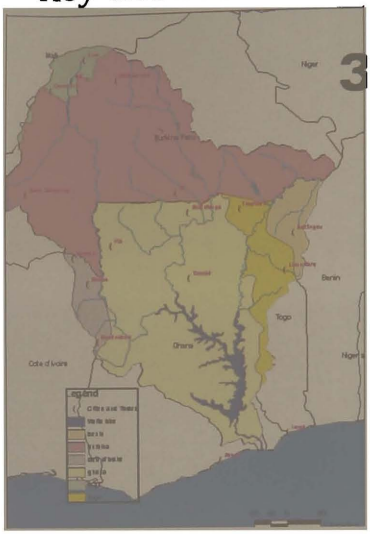
The PAGEV Project Pilot Zone



Source: IUCN

Appendix 5

Key Characteristics of the Volta



- The Volta River Basin covers an estimated area of 400,000 km^2 of the sub-humid to semi-arid West-African savannah zone,
- The basin is shared by six countries-(Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mali & Togo).
- 85% of the total basin area is shared between Burkina Faso and Ghana
- Its water resources is a key developmental resource for Burkina and Ghana.

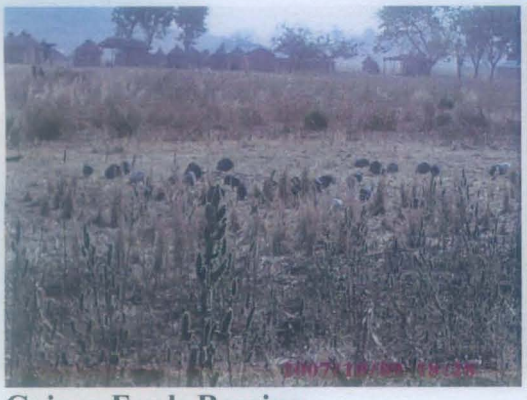
IUCN

Source: IUCN

Appendix 6

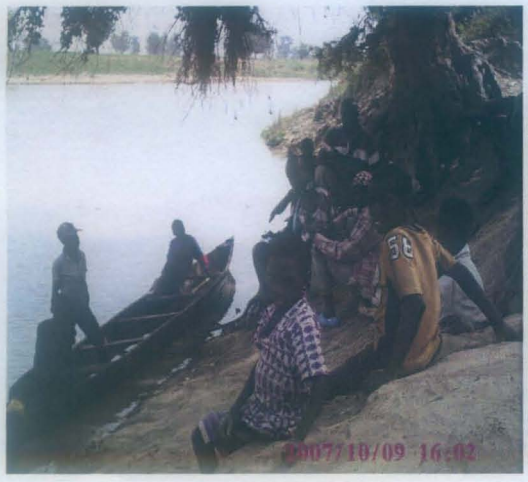
Photographs of Livelihood Activities along the White Volta

Water Melon & Onion Farms along the River



Guinea Fowls Rearing

Sheep Rearing



Fishing/River Transportation

Cattle Rearing