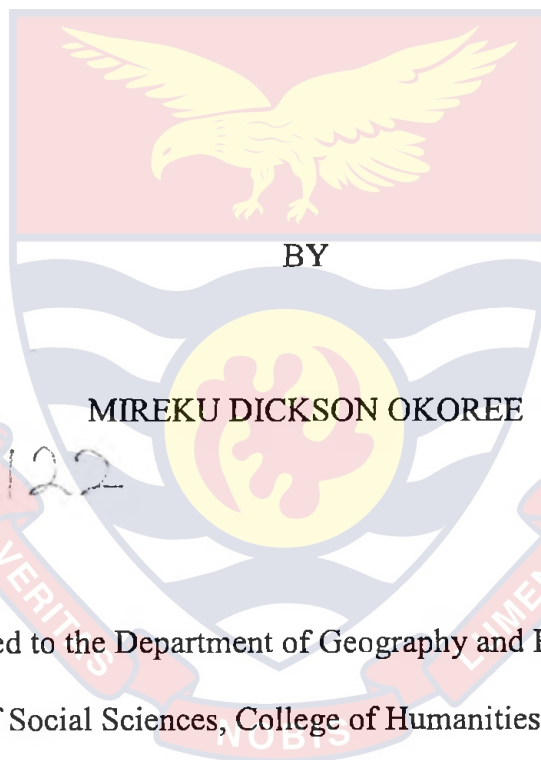




UNIVERSITY OF CAPE COAST

INSTITUTIONAL DYNAMICS FOR MANAGING THE LOWER
ANKOBRA RIVER BASIN IN THE WESTERN REGION OF GHANA



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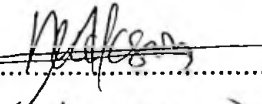
This thesis submitted to the Department of Geography and Regional Planning of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy degree in Geography and Regional Planning

MARCH 2018

DECLARATION

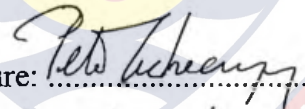
Candidate's Declaration

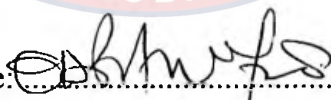
I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

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Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

Dynamic management systems for equitable distribution of drainage basin resources for local communities have become necessary because of the failure of early discriminatory institutional approaches that were used by countries all over the world. Hence, the need to improve the capacities, and strengthen the functional networks among management institutions such as those responsible for river basins in developing countries such as Ghana has become more critical considering the fast rate of degradation of the river basins.

The main objective of the study was to examine the institutional dynamics for managing the resources of the Lower Ankobra River Basin in the Western Region of Ghana. The study adopted the descriptive research design. Using in-depth and semi-structured interview guides, data was solicited from 268 respondents who played several roles in the conservation of the basin's resources. The study revealed good levels of collaboration among national-level or top management institutions where policies were formulated. However, at the first-line or lower level of management, there were challenges relating to financial, technical and legal capacities, and functional networks among the institutions. The major consequences of such challenges were the fast depletion, and the limited opportunities available for the local users of the basin. The study recommends to government of Ghana to set up a single institution with several departments that should work with the principles of equity, accountability and efficiency that have been prescribed by the egalitarian society to equitably share, and conserve, the resources in the Lower Ankobra Basin for its users.

KEY WORDS

Drainage basins

Equity

Institutional dynamics

Management principles and approaches

Management institutions

User institutions



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DEDICATION

To my wife, Rebecca Mireku and my three children, Betty Akosua Mireku,
Ranissi Victor Mireku and Emerald Manna Okoree Mireku



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LIST OF ACRONYMS

DDC	District Development Committee
DEHP	Department of Environment and Heritage Protection
EPA	Environmental Protection Agency
ESCAP	Economic and Social Commission for Asia and the Pacific
ESRC	Economic and Social Research Council
FAO	Food and Agriculture Organization
FC	Forestry Commission
FON	Friends Of The Nations
GoG	Government Of Ghana
GWCL	Ghana Water Company Limited
GWSC	Ghana Water and Sewerage Corporation
HSD	Hydrological Service Department
ICWE	International Conference on Water and Environment
IDA	Irrigation Development Authority
IIED	International Institute for Environment and Development
ISWMP	Integrated Soil and Water Management Programme
IUCN	International Union for the Conservation of Nature
IWM	Integrated Drainage Basin Management
IWMF	Integrated Drainage Basin Management Framework
JICA	Japanese International Corporation Agency
MC	Mining Commission
MCEs	Municipal Chief Executives
MoF	Ministry of Finance
MoFA	Ministry of Food and Agriculture

MSD	Meteorological Service Department
NDPC	National Development Planning Commission
NGO	Non-Governmental Organization
NLCD	National Liberation Council Decree
NRCD	National Redemption Council Decree
PDBM	Participatory Drainage Basin Management
SCP	Soil Conservation Programme
UNCHE	United Nations Conference on Human Environment
UNEP	United Nations Environment Programme
USA	United State of America
USAID	United State Agency For International Development
USRC	United State Research Council
WRC	Water Resource Commission
WRI	World Resource Institute
WBG	World Bank Group



CHAPTER ONE

INTRODUCTION

Background to the study

Prior to the late 1960s, the problems associated with the management of natural resources in most local communities of developing countries received little attention from authorities. In addition to this, the responses of governments to those localised problems were generally on ad hoc basis, for they contained improper management strategies (Alhassan, 2009).

The world's natural resource management issues were first discussed in 1972 at the United Nations Conference on Human Environment (UNCHE) in Stockholm. Representatives from several countries came together to deliberate on how best they could manage the chronic environmental problems that threatened the security of natural resources. Sequel to that, international calls were intensified, and these resulted in the establishment of the United Nations Environment Programme (UNEP) which was aimed at promoting international cooperation on environmental management especially on water resources (Mazvimavi, 2002).

In the year 2000, the World Bank Group (WBG) and the United States Research Council (USRC) at the Johannesburg World Summit on Sustainable Development, launched a campaign on water resource protection through the establishment of environmental management projects and programmes (Mote, 2004). The campaign was raised at the World Social Forum of 1970 in Germany (Sleage, 2013), where much attention was drawn to the urgent need to sustainably use water resources (Hartford, 2010). That led to the introduction of the idea of conservation of water resources. At the World

Social Forum (1970), representatives from both developed and developing countries supported the conservation of water resources for the reasons that water is needed for the production of food, and medicinal herbs [World Natural Resource Conservation (WNRC), 2012]. Examples of water resources which much attention was given to were lagoons, lakes, rivers and drainage basins (Sleage).

According to Acheampong (2009) and the World Bank (2011), a drainage basin is the catchment area which is drained by a major river and its tributaries. It is the entire area drained by the river and its tributaries and is marked by the elevated parts that separate the river and its tributaries from those of other rivers. According to Pradhan (2011), a drainage basin is that area of land within which all living things such as human beings are inextricably linked to a bounded hydrological system. The implication of the last definition is that, drainage basins are part of human dwellings, and are therefore important resources that require communities to properly plan their use.

Brown and Kennedy (2013) have observed that planning the use of a drainage basin means putting in place systems which ensure that the land and water resources in a basin are preserved and exploited sustainably. In the meantime, Marther and Chapman (2014) have given three recommendations for local management institutions, especially those in West Africa, to consider when planning the use of drainage basin resources. They suggested that the planning processes should include the setting up of short-term objectives, the formulation of policies, and the use of effective strategies or approaches for achievement of long-term conservation goals. The implication here is that the

planning for the use of drainage basin resources follows a systematic procedure, and it is needed as a foundational block for building management systems for conservation, or sustainable development of drainage basin resources.

In the opinion of Carson (2014), systems developed by community-based management institutions for conserving drainage basin resources must aim at reducing common environmental problems such as land degradation that tends to affect future production. Unfortunately, degradation of drainage basins in recent years has caused a reduction in quantity and quality of agricultural products in most countries of the world (Holling, 2010). For example, from the proceedings of an International Conference on Water Management and Conservation (IWMC), it was noted that degradation of drainage basin resources reduced the world's food production by about 35 percent (Brooks, Folliot, & Thames, 2010).

Depletion of drainage basins' resources, especially in developing countries, has been caused by a number of natural and anthropogenic factors that include soil erosion, bad farming practices, over-extraction of water, overgrazing, deforestation, pollution and excessive sedimentation (Gunderson, 2014). Perera and Fernando (2015) have observed that degradation is the leading cause of soil erosion and the loss of agricultural lands in drainage basins. Lal (2013) has reported that 1,094 million hectares (ha) of agricultural lands in drainage basins in Africa are degraded each year due to erosion.

The cases of environmental degradation and their adverse socio-economic impacts have necessitated the need for countries, especially those in Africa and Asia, to search for effective and good management systems instead

of the reliance on rudimentary management practices and indiscriminate approaches (Follock, 2010). As such, the World Bank (2010) opines that the allocation of drainage basin resources should be done strategically and comprehensively, and should be based on good management approaches.

Good management approaches, according to the United Nations Development Programme (UNDP) and the Sustainable Human Development (SHD) (1997), must incorporate sound principles that ensure equity and efficiency. The UNDP (2009) opines that effective approaches for managing social services stand on strong strategic principles that include legitimacy and voice, strategic vision, performance, accountability and fairness. The UNDP calls these principles 'good governance principles', and it encourages all public institutions to incorporate them into management operations for the following reasons: First, the UNDP realises that good principles such as accountability and transparent mechanisms when put in place, ensure that actions and decisions taken by public officials are subject to official monitoring. Second, the UNDP also observes on many occasions that when institutions fail to achieve some set objectives, transparent in-check mechanisms are neglected. The implication from the above is that, models that ensure transparency during management operations, produce good results, and should be followed by institutions at all cost. Third, to facilitate project planning, monitoring and evaluation, the UNDP directs that natural resource management institutions should always consult local communities.

The implication from the UNDP's observations on 'good governance principles' is that community participation should be complementary to accountability and transparency in order to improve on performance and

increase efficiency. Arroyo and Sirker (2011) and the World Bank (2014) have therefore advised that every resource management organisation should use approaches that follow sound management principles to distribute goods and services in a manner that ensures fairness and equity.

Statement of the problem

Smith (2013) and Opong (2014) have documented the attempts that have been made by the government of Ghana in the past two decades to improve management systems of drainage basins and the principles for sharing drainage basin resources. Notable among the attempts were the introduction of integrated approaches that contained policies which aimed at promoting equitable sharing of drainage basin resources. But when the integrated approaches were adopted, they created confusion in many systems for managing drainage basins, especially where they conflicted with existing customary laws and regulations (Opong).

In 1996, the Water Resource Commission (WRC) of Ghana was established by an Act of Parliament (*Water Resource Management Act 522*), and was empowered to streamline the activities of all river basin users, both domestic and industrial (WRC, 2000). To ensure effective delivery of its duties, the WRC was later given the support of the National Development Planning Commission (NDPC), and the Ministry of Works and Housing (MWH) to coordinate national development plans, and formulate policies regarding the uses of drainage basins (Amakye, 2012). Subordinate management institutions or agents such as the Forestry Commission (FC), the Environmental Protection Agency (EPA), and the Minerals Commission (MC) were also established, and were given special roles to support the work of the

WRC which was expected to prevent degradation, promote conservation, and create equal access for all drainage basin users (Amakye).

Unfortunately, the attempts that were made by government of Ghana (GoG) to create equal opportunities for individuals and industrial users of resources in drainage basins appear to have failed. For example, while mining laws permit large-scale companies to extract gold, bauxite, timber from the Lower Ankobra River Basin in the Western Region of Ghana, some of the local inhabitants have been prevented by state institutions such as the EPA and the FC to extract the resources from the streams and rivers (Mireku, 2013). The implication is that the current system of sharing resources in places such as the Lower Ankobra River Basin has failed, and is also opposing the objective of government of Ghana so far as integrated management is concerned.

The failure of the local institutions to establish a proper management system for sharing the resources of the Lower Ankobra River Basin raises a number of critical questions such as:

- what responsibilities have been neglected by the institutions overseeing the management of the Lower Ankobra River Basin?
- what is the capacity of each of the local institutions responsible for managing the resources of the Lower Ankobra River Basin?
- how functional have the networks of the institutions that are responsible for managing the Lower Ankobra River Basin been?
- how have the current management approaches or principles affected the sharing of resources in the Lower Ankobra River Basin?

Objectives of the study

The main objective of the study is to examine the institutional dynamics for managing the resources in the Lower Ankobra River Basin. The specific objectives are to:

1. assess the capacity of the local institutions responsible for managing the Lower Ankobra River Basin;
2. examine the functionality of the networks that exist among the institutions responsible for managing the Lower Ankobra River Basin,
3. evaluate the approaches or principles for sharing the resources in the Lower Ankobra River Basin and
4. recommend good approaches or principles that will be mutually beneficial to all key stakeholders responsible for the management of the resources in the Lower Ankobra River Basin.

Research questions

1. What is the capacity of the local institutions responsible for managing the Lower Ankobra River Basin?
2. How functional are the networks that exist among the institutions responsible for managing the Lower Ankobra River Basin?
3. How have the current management approaches or principles affected the sharing of the resources in the Lower Ankobra River Basin?

Significance of the study

Drainage basin management is needed to support socio-economic activities such as farming, fishing and the drawing of freshwater to support urban and rural communities (Bullock, 2014). In Ghana and in particular the Western Region of the country where most drainage basins are located, the

functional systems of institutions in charge of resource conservation is weak (Bullock). For example, the major stakeholders in the Lower Ankobra River Basin have failed to follow the appropriate methods for the equitable distribution of the resources in the basin. It is therefore hoped that the findings of the present study will provide sustainable management approaches that all stakeholders (including managers, individuals, local authorities and industries), should adopt to conserve the resources of the Lower Ankobra River Basin.

This study, it is hoped, will identify best governance principles that could be used for effective management of drainage basins in Ghana and elsewhere. The low level of transparency, accountability, and the non-adoption of management principles (Mireku, 2014) that have contributed to weak governance, and which have had negative implications on the quality of services derived from drainage basins will be eliminated. This study, it is hoped, will put in place governance structures that will lead to the adoption of proper management principles for drainage basin conservation.

The findings of the study, it is hoped, will contribute to the on-going debate and research on the effective development and management of drainage basin resources in Ghana. Finally, the results of the study will serve as a useful reference material on drainage basin management.

Delimitations

The research focused only on the role of management institutions at the lower section of the Ankobra River Basin. Although, Mensah (2005) has stated that where several water bodies and basins straddle more than one district, unsustainable uses in one district affect the riparian districts, and this

calls for a collaborative project building by all, to bring mutual benefits to parties concerned. This study places emphasis on the assessment of the functions of the local institutions that managed the resources at the lower portion of the River Ankobra basin, to limit the geographical scope of the study that could have been a challenge during data collection.

The research looked at how the local institutions' approach to management affected the benefits derived by the sole users of the basin's resources such as farmers, miners, sand winners and fisher-folks. Consequently, the views of the sole or direct users were employed in the analysis of data; the study did not consider the views of indirect beneficiaries such as domestic or household users of the basin's resources. This was done because the activities of the indirect users impacted insignificantly on the resources in the basin, and that made their suggestions irrelevant for sustainable development of the resources of the basin.

The study could also not take into account the roles that certain civil society groups played in the management of the resources in the basin; most of these groups had collapsed before the study was conducted. Hence, they became unreliable for data collection, even though they had played some roles towards managing resources in the basin.

Limitations

The study used in most cases, interviews schedules for the data collection exercise which lasted for a period of eight months. However, if another research is carried out in the study area using only non-participatory observation techniques (as the only data collection method) for a relatively longer period, it may be insightful. This follows the argument by Sarantakos

(2005) that observations allow researchers to adequately study sequence of events in natural settings; they help researchers to obtain direct and reliable information about changing environmental conditions. Hence, to be able to trace the positive or negative developments of the resources in the Lower Ankobra River Basin, a longitudinal study which involves non-participatory observations will certainly bring sequential data for strategic management.

Definition of terms

Breach of contract: it is the refusal of a principal (superior) to cancel a contract when, or if an agent (subordinate) has no resources to perform a task.

Clientelism: it is a term used to describe the attempts by political patrons or representatives to provide users of community resources certain services in exchange for political favours.

'Complementarity of views': it is a concept that explains the views or ideas that supplement each other; it is often employed in mixed method approach in research.

Egalitarian society: a society that holds philosophical precepts that all people must have equal opportunities irrespective of their class or creed.

Friends of the Nations (FON): a non-governmental organisation that has been established in Ghana to support natural management activities.

Information filters: it is a term that describes the approaches or methods used by subordinate organisations to evaluate information; they are methods adopted to praise authorities in order to get favours from them (the heads).

Information overloads: it is a term that describes the excesses of information or instructions that end up diverting the focus of management institutions from the responsibilities assigned to them.

Interpretivism: it is a qualitative research methodology that describes realities based on socially constructed views of individuals; it is a subjective way of conferring meaning unto phenomena. It is sometimes referred to as '*constructionism*'

Local management institution: it is a state institution or a non-governmental organisation that has been established at the local or district level to manage the resources in drainage basins.

Top management institution: it is a state institution or a non-governmental organisation that has been established at the top or national level to manage the resources in drainage basins.

Multiple agency relationship: It is a type of principal agency relationship where there are two or more principals; in this relationship the principals are the superior bodies that are expected to provide resources for the agents to work with.

Ontology: it is a branch of metaphysics concerned with the nature of "being" or "existence".

Public expenditure tracking (PET): it is a technique used to detect fraud in public management organisations. PET also allows users of services to reconcile incoming funds with expenditures. The alternative term for PET is "following the money".

Sectoral institutional management approach: it is an approach that involves activities undertaken by institutions with different agenda or priorities.

User Institution: it is a state institution or a non-governmental organisation that has been established to use resources in drainage basins.

Utilitarians: a group of people who hold the belief that “something is ‘morally’ right if it helps a majority of people to obtain maximum satisfaction”

Yen Poano (YP): an Akan expression which literally means *Our Shore*; it is the name of a non-governmental organisation established to support resource management activities in the Western Region of Ghana.

Organisation of the study

The thesis is organised into eight chapters. Chapter One comprises the background information, the statement of the problem, and the objectives of the study. It also presents the significance and the scope of the study. Chapter Two focuses on the review of related literature on drainage basin management, while Chapter Three concerns itself with the review of empirical studies and the conceptual frameworks guiding the study. The research methodology which comprises the research design, sampling procedures, data collection and analysis are presented in Chapter Four. Chapter Five presents the discussion on the capacities in relation to the responsibilities of the management institutions, while Chapter Six discusses the functionality of networks among the institutions. Chapter Seven describes the approaches and principles that have been followed to regulate or share the resources in the Lower Ankobra River Basin. Finally, Chapter Eight presents the summary, conclusions, and recommendations for further study.

CHAPTER TWO

CONCEPTS AND THEORIES OF RIVER BASIN MANAGEMENT

Introduction

This chapter presents the literature related to drainage basin management and the themes that underpin it. The chapter first provides the definitions of terminologies used in drainage basin management, which have been used in this study. It reviews the literature of key issues on drainage basin management along the following themes: definitions of drainage basin and drainage basin management and benefits of drainage basins. The meanings of institutions, institutional networks and dynamism, and management principles have also been outlined in this chapter. The main challenges that certain institutions encounter in the course of managing drainage basins have been explored. The chapter ends with a review of the relevant theories that informed the study.

Definition of drainage basin

According to Acheampong (2009) and the World Bank (2011), a drainage basin is a catchment area into which drains a river and all its tributaries. In other words, it is the entire area drained by a river and all its tributaries. All drainage basins are separated by divides that follow the elevated land separating the headwater tributaries flowing into each major river.

According to Pradhan (2011), a drainage basin is the area of land within which all living things including human beings are inextricably linked or connected to a bounded hydrological system. Drainage basins are,

therefore, part of human habitats; and hence they become very important assets that communities try to sustainably manage (Pradhan).

Definition of drainage basin management

Pradhan (2011) argues that drainage basin management does not lend itself to any specific definition. The variations in the definitions depend on the objective of the management institutions and the resources available for operation. Nevertheless, some institutions and individuals have given the following definitions that are relevant to the present study.

Global Water Partnership (2000) defines drainage basin management as a process that consists of coordinated and regulated development of basin resources in order to maximise all the socio-economic benefits (in the basin) in an equitable manner that sustains the ecosystems. Water Governance Facility (2013) also defines drainage basin management as the way local institutions and local people regulate the use and management of drainage basin resources. Essentially, the two definitions above stress the need for drainage basin managers to undertake coordinated projects that meet the interest of all users while promoting conservation and sustainability. In other words, drainage basin management defines the roles that managers should play in order to support beneficiaries or users all the time

Steins (2014) and Hirsch (2015) defined drainage basin management with much emphasis on community participation. To the authors, community participation gingers up local technical support and ideas for sustainable development. Biswas and Tortajada (2015) opine that drainage basin management must be placed in the context of indigenisation and community-involvement. The implication from the above is that for any drainage basin

management system to produce desired results, it must have structures that diagnose problems and bring on board incentives or packages that attract the participation of the surrounding communities.

Although there seems to be some variations in the definitions presented so far, the basic tenets are the same. From the aforementioned definitions, it is clear that every drainage basin management:

- requires functional institutions to play effective roles to serve beneficiaries; and
- must employ local ideas through community participation and involvement.

Benefits of drainage basins

The Millennium Assessment Group (2009) has described the benefits of drainage basins as the natural and human (tangible and intangible) resources that are relevant in livelihood activities. Based on this description, Daily (2011) classified the benefits derived from drainage basins into natural and economic benefits. He listed soil erosion regulation and pollination control as some examples of natural benefits, and food and fresh water supply as some examples of economic benefits, and also identified some important roles that man can play to improve the economic benefits of drainage basins. For this reason, Malena, Daddieh and Odei-Tettey (2013) have suggested that countries that wish to fully develop drainage basin resources must be prepared to employ adequate human resource at every stage of management processes.

To operationalise the concept 'benefits of drainage basin', Moberg and Folke (2009) referred to the benefits of drainage basins as 'services'. The authors categorised services into three themes, that are provisional, regulatory,

and cultural (Table 1). From Table 1, provisional services or products from drainage basins are food, fresh water, fuel wood, and bio-chemicals. The authors listed climate, disease, and water regulation, water purification, pollination and soil erosion control, as examples of regulatory services that help to control natural processes in drainage basins. Moberg and Folke described cultural services of drainage basins as ‘non-material’. They listed spiritual and religious, recreational and ecotourism, aesthetic heritage and inspiration, as some common examples. Following the categorisations by Moberg and Folke of the benefits of drainage basins, Goodpaster (2010) and Geddes (2013) identified recycling of nutrient and maintenance of local regions as part of supporting services in drainage basins.

Table 1: Classification of drainage basin services

Provisional services (Natural products obtained from drainage basins)	Regulatory services (Intangible items obtained from control processes of drainage basins)	Cultural services (Non-material services obtained from drainage basins)
Food	Climate regulation	Spiritual and religious
Fresh water	Diseases regulation	Recreation and ecotourism
Fuel wood	Water regulation	Aesthetic and cultural heritage
Fibre	Water purification	Inspiration
Bio-chemicals	Pollination control	Educational
Genetic resources	Soil Erosion regulation	Sense of people

Source: Adapted from Moberg and Folke (2009), Goodpaster (2010) and Geddes (2013)

The meaning of institutions

According to Okun (2013), institutions are formal or official units, such as government ministries, that have been given resources to work towards a set of objectives. In the opinion of Merrey (2011), institutions are any established organisation with mandates to work towards a particular goal. Saleth and Dinar (2012) refer to institution for drainage basin management as a combination of policies, laws, rules and regulations, organisational core values, operational procedures, incentive mechanisms, accountability mechanisms, norms, traditions, practices and customs, that have been established to preserve the ecological systems of drainage basins. According to Griffin (1999), most drainage basin management institutions are meant to constrain the socially undesirable behaviour of individuals and groups in the distribution and use of drainage basin resources. The implication from the above is that some river basin related institutions such as those governing watershed user associations, are designed to promote organised behaviour and equity, and to provide various opportunities for individuals and group advancement. Thus institutional rules established for drainage basin management, when adhered to, help to reduce the uncertainty of human actions such as illegal mining, fishing, lumbering and sand winning (Hooper, McDonald, & Mitchell, 1999). These definitions cover three important elements of the concept of institutions which are policies, laws and roles of institutions as reported by Saleth and Dinar.

For the purpose of this study, established institutions for drainage basin management have been defined as those concerned with government policies,

traditional laws, and organisational roles. These are the main elements for regulating human actions while exploiting drainage basin resources.

The meaning of institutional networks

According to Okun (2013), linkages among institutions are institutional networks. Institutional networks (in any management setup) are very important to enhance effective delivery of services (Oppong, 2014). Oppong has identified vertical and horizontal linkages to be the major types of institutional networks. In his opinion, where there are consultative-supervisory linkages, vertical networks are established, whereas coordination among organisations on lateral levels (with equal mandate for operation) facilitates horizontal linkages (Okun). Joshi (2008) realised that horizontal coordination is difficult to maintain, particularly when organisations are in hierarchies, but is necessary to integrate ideas from the bottom to the top and vice versa. The implication of the findings of Joshi is that organisations with equal mandate to work should cooperate with one another without superimposing authority.

Hayward (2015) observed that vertical coordination among organisations involves a two-way process of transferring expert experience from the top and submission of ideas from the bottom to higher authorities. Hayward suggests that networks among social institutions should be defined properly in any legal framework for resource management in order to increase mandate, and to avoid conflicting operations. Similarly, drainage basin management objectives are achievable only when there are policies and regulations that allow and encourage institutions to work together at all levels. For example, a critical observation of the networks in the institutional framework designed by the WRC of Ghana reveals some important linkages

that should bind the WRC and its subordinate institutions to formulate policies, design projects and implement them. The Water Resource Commission (WRC) was established by an Act of parliament (Act 522 of 1996) to work with the collaborative assistance of all supporting water resources management institutions in all regions of Ghana (Oppong, 2014).

The WRC is expected to work in collaboration with two main institutions: the Ministry of Works and Housing (MWH), and the National Development Planning Commission (NDPC), to strengthen a horizontal linkage among these institutions. The WRC implements water resource policies formulated by the MWH. Similarly, the NDPC has been mandated to constantly coordinate national development plans on behalf of WRC that allocates drainage basin resources to local users (Oldeman, 2008). Furthermore, the WRC is expected to frequently supervise water planning input providers such as civil society representative groups and governmental organisations, to strengthen the downward vertical linkage between these parties (Mensah, 2008). It is also the duty of these subordinate institutions to constantly consult the WRC before taking decisions on every single project to promote an upward vertical linkage.

Thus, the effective deliveries of duties by the WRC and by its supporting institutions require strong linkages that can support and improve the functionality of networks among these institutions. The above implies that strong institutional linkages or networks are indispensable as far as the management of natural resources such as drainage basins are concerned.

The meaning of institutional dynamism

The rate of changes in the functions and roles of institutions is institutional dynamism (Saleth and Dinar, 2012). To Saleth and Dinar (2012), institutions may be described as dynamic if they have the ability to change their approaches or methods of operation. Merrey (2011) opines that dynamic systems are needed to arrest changing circumstances that are likely to affect the smooth operation of institutions. Merrey identified supervision, consultations, cooperation and collaboration as the best examples of management practices that help institutions to become dynamic. Merrey again observed that consultations help to maintain strong level of vertical coordination between subordinate and top management institutions. Bandaragoda and Firdousi (2002) describe vertical coordination as a process that is facilitated by top management institutions that assume supervisory roles to direct activities of lower-ranked institutions. Joshi (2008) too observed that frequent levels of cooperation are the best examples of coordination that can promote institutional dynamisms. He stressed the importance of integration of ideas in institutions with equal mandate for operation. The implication of the observation of Joshi is that organisations with the same mandates must work without showing any superiority over one another – to maintain, or improve institutional relations.

In the opinion of Hayward (2015), institutional dynamism depends on the strength of the linkages and the effective roles of management organisations. To substantiate this argument, Hayward traced linkages that existed between the Kenyan Natural Resource Institute (KWRI) and its subordinate institutions. It was realised that whenever the KWRI increased

supervisory duties, it steered up the relationship that it had with its subordinate institutions. Hayward further observed that whenever subordinate institutions consulted the KWRI before taking decisions, they were appropriately directed. Hayward therefore advised that regular consultative roles must be played by top and lower-ranked institutions since the building of dynamic systems for management is a shared responsibility.

Management principles

Management principles are organisational guidelines that are put in place to influence human behaviour such as the actions of workers in a management set-up for desirable outcomes (Hanks, Edwards, Kanjar, Janifer & Mikins, 2009). Aguilera and Cuervo-Cazurra (2010) have defined management principles as organisational standards and practices such as transparency, accountability, and equity that direct institutions to achieve their set goals. The above definitions tend to emphasise one core point of management principles which is the need to control human behaviour by an organisation in order to achieve desirable goals. Thus, without the use of management principles, an institution is likely to fail, or encounter some challenges that may affect its successful operation.

Hence, major issues about institutional challenges stem basically from the haphazard use of management principles as documented by Allan and Curtis (2005), and Stålgren (2006). Allmendinger (2008) has observed that without proper enforcement of sound management principles, it becomes difficult for an organisation to detect malfeasance, tackle corruption, and address issues of embezzlement. Alexander (2009) too has observed that the use of appropriate management principles helps institutions to respond to the

needs of local people and also to increase community participation. The implication of the above observation is that the adherence to management principles is crucial, especially when it comes to management of community resources. Consequently, the United Nations Development Programme (UNDP) and the Sustainable Human Development (SHD) have since 1997 been advising institutions that provide social services to work with four management principles that are transparency, accountability, efficiency and equity, because the principles enable institutions in many developed countries to effectively distribute social amenities such as water with minimum effort.

Principle of transparency

Budds and McGranahan (2013) refer to principle of transparency as a set of guidelines that help project beneficiaries to explore the extent to which production procedures and outcomes are opened to scrutiny. To Boelens (2014), principle of transparency must open access to official information. Boelens's contention is that transparency is required at the lower level of management and among officials who try to find fault with one another.

The need for transparency in the management of social or public facilities has been observed by Cleaver, Franks, Boesten and Kiire (2015) to have improved accountability, reduced corruption, and encouraged local participation. Butterworth (2015) has therefore advised natural resource management institutions to pay particular attention to transparent management approaches that are acceptable to local communities. To Butterworth, transparency helps local people to evaluate the:

- Quality of information given to local people about the value of products delivered by management institutions;

- Sanctions imposed by management institutions for illegal uses of natural resources, and
- Benefits that local people derive at every developmental stage of natural-resource-management project.

Butterworth (2015), and Fritz, Kaiser and Levy (2015) have therefore urged natural resource management institutions to critically scrutinise the information they deliver to local communities. The authors have cautioned that such information should be accurate, up-to-date, and timely. They have suggested that such information should be delivered prior to major decision-making and in a format or language that is easily understood (by even non-experts) to enhance transparency. In the attempt to deliver information to local people, Jacobson, Mutono, Nielsen, Leary, Donal and Rosemary (2010) recommend the use of public notice-boards (instead of websites) as the most effective communication platform that enables local community members to understand the messages of management institutions. The implication here is that the medium for communicating information to local communities becomes important when it comes to drawing community participation into management processes. There should be appropriate platform on which information about project management to local people should be disseminated. Otherwise, local communities will not participate in project management.

Christiansen, Coyle and Lockhart (2010) suggested a legal dimension to the processes of ensuring transparency when they came to a conclusion that transparent management principles should always be supported by strong judicial system, or by effective state supervisory team that has the power of attorney to bring management institutions to order. Christiansen et al. have

further suggested that since supportive judicial system fortifies advocacy groups, local communities should demand official information on project development from management institutions.

Principle of accountability

According to the UNDP (2012), 'accountability principles' are sets of requirements or supervision modes that make officials or institutions in public and private sectors answerable to the actions that they take. As such, the Organisation for Economic Co-operation and Development [OECD] (2013) says that accountability principle should require the support of citizens who can constructively criticise public institutions and government officials, and even hold them responsible for their actions.

The principle of accountability has often been used synonymously with transparent management principle; consequently that has affected the measurement of the two principles (Spring & Groelsema, 2011). Spring and Groelsema therefore made a distinction between the two (principles) when they assessed the nature of reports given to local people on the damages of natural disasters. Spring and Groelsema have consequently advised management institutions to display documents at appropriate venues to enable local people to detect fraudulent deals in their operations.

Vijayalakshmi (2012) has identified social and vertical approaches that modern societies may use to demand accountability from higher authorities. Social accountability has been defined by the UNDP (2010) as a move taken by people, the media, or any civil society organisation to hold states and decision makers accountable for the resources used. Hence, to ensure social accountability, Plummer and Cross (2007) have recommended the use of

investigative journalism, public hearings, opinion polls, participatory public policy-making and expenditure tracking as the approaches effective enough to detect poor performance, illegal acts, and abuse of power in local management institutions. Promoting vertical accountability, on the other hand, requires external or independent bodies to ensure that management institutions comply with established standards and guidelines that govern their work (Budds & McGranahan, 2013). It is based on this premise that Plummer (2007) and Vaughan and Tronvoll (2008) suggested that the best way to ensure that management institutions comply with established standards, is to establish oversight institutions that are supported by strong legal mandate to enforce by-laws that govern performance of lower-ranked institutions.

Principle of efficiency

Principles of efficiency, according to Sam (2010), are the standards that guide institutions to accomplish tasks on time. Put differently, Boedeltje and Cornips (2012) suggest that principles of efficiency are norms and codes of practices that direct institutions to maximise output from a given resource. Sam further argues that management institutions may have the right approaches for operation, but may not be efficient enough, since they may fail to produce quality output. The implication of this is that ensuring 'quality' in production should be the ultimate goal of any institution that wants to be described as efficient.

Inefficient levels of production in many state institutions in developing countries have become topical issues (Morrison, McDonald, & Lane, 2009). For example, Moore (2010) described public institutions in Malawi as inefficient when he observed that institutions undertook unprofitable ventures;

institutions embarked on operations that led to waste of state funds. To avoid that, Moore strongly recommended proper coordination of activities at the national and local levels. In another case, Newman, Barnes, Sullivan and Knops (2004) have observed that sound levels of coordination support institutions at all levels of management (top, middle and first-line), and are necessary for the promotion of efficiency. The implication of Newman et al.'s observation is that sound levels of coordination among institutions are indispensable as far as the building of resource management systems is concerned.

Martin and Verbeek (2002) have observed that many organisations in developing countries usually have democratic authority to work, but are less efficient. The causes of such inefficiencies, according to the researchers, stem from a number of factors, the most predominant being governments' inability to supply resources for operation, and the prevalence of weak legal systems (Dovers, 2005; Moore, 2010). Boedeltje and Cornips (2012) have suggested three key strategies to management institutions in developing countries for resource generation if governments fail to perform. In terms of failure, the authors advise that resource management institutions should build capacity by:

- promoting high levels of coordination to maintain linkages that ensure collaborative support in project building,
- effective planning of the use of resources through proper budgeting and
- utilisation of local resources instead of exotic ones to develop projects.

McGregor (2013) has emphasised on the need for management institutions to use high quality inputs or resources to ensure efficiency.

Principle of equity

Olsson, Folke and Berkes (2004) have defined equity management principle as the standard that is put in place by authorities to ensure that all members of a society get equal opportunities to maintain or improve their well-being. The authors have also observed that going by the principle of equity is to uphold the rights of citizens, and satisfy their needs on time. Consequently, Newman et al. (2004) have suggested that the best way to ensure equity when managing social resources is to provide opportunities to beneficiaries irrespective of their class, level of education, income status, tribe or creed. In this regard, the authors recommend the use of open-access approaches for the promotion of equity standards in the sharing of social resources. Hardin (1968), on the other hand argues that it is not advisable for societies to promote equity management principles by using open-access methods or approaches. Consequently, Newman et al. recommend the use of management systems that have in-built mechanisms and structures to eliminate excessive competition and exploitation. Finally, Olsson et al. have recommended the implementation of pro-poor policies to control resource extraction, especially in pluralistic societies. The argument of Olsson and his associates is based on the fact that the use of pro-poor policies helps to bridge the gaps in incomes of the rich and the poor.

Challenges in natural resource management

Challenges in natural resource management are the constraints that prevent effective conservation and utilisation of natural resources (Olsson et al., 2004; Nthunya, 2002). Min (2004) has categorised these natural resource management constraints under ecological, social and institutional factors and

has also grouped siltation, sediment discharge, and damages that are caused by natural disasters under ecological challenges. Min has suggested that these hazards must be avoided to enhance the performance of management institutions. Similarly, Fleming (2003) has identified human-induced obstacles (such as trans-boundary conflicts) as social challenges that have the greatest tendency to impede effective planning and distribution of natural resources.

Institutional challenges have also been categorised into technical, financial and legal constraints by Fukuyama (2009) who identified technical institutional challenges as the constraints that stem from inadequate logistics and human resource (that have much potential to jeopardise project implementation, monitoring and evaluation). Fukuyama's argument is that technical capacity for project monitoring is necessary to promote cooperation among institutions that have been given common tasks. The implication of the findings from Fukuyama's work is that adequate technical capacity strengthens individual institutions to work co-operatively for the achievement of a common goal. Matheny (2010) has consequently stressed the need for refresher courses as a means to improve on technical capacity to generate greater workforce to enhance healthy collaborations among institutions.

Opoku-Agyemang (2001) has observed that the use of modern machines improves technical capacity of management organisations. Although, Opoku-Agyemang, and Matheny (2010) have divergent views on technical capacities of management institutions, each concludes that the achievement of maximum output depends on the availability of adequate machinery and human resource. These views of the two authors have been criticised by Daley and Farley (2004), and by Kerr and Brown (2007) who

recommended the use of division of labour, and capital intensive methods for the improvement of technical capacities of institutions.

Many state institutions in Africa have been observed to have managerial incompetence because of low technical and human capacities. Aryee (2008) has identified the act of politicisation of appointments by political patrons as the major cause of poor performance in public institutions. In his study, the author described those government appointees as 'controlled machinery' who are put in place to achieve political goals. The results of appointing incompetent party members to occupy certain government positions, as reported by Noble (2009) and Agrawal (2001), are absenteeism and embezzlement of funds.

Another important aspect of institutional capacity that needs to be improved to enhance effective management of natural resources is financial capacity. According to Gretel (2008), natural resource conservation requires adequate funding, especially in developing countries where concern for environmental resources is low. As a result, the World Bank Group (WBG), for example, invested US\$1.73 billion into natural resource management in five Middle East Countries comprising Syria, Palestine, Qatar, Kuwait and United Arab Emirates between 1990 and 2004. The World Bank (2010) also gives to developing countries in Africa between US\$ 21 million and US\$ 91 million annually to develop their drainage basins (Cornor & Dover, 2004). This implies that drainage basin management requires adequate funding.

Social problems adversely affect natural resource management (Cornor & Dover, 2004; Granovetter, 2003). Social problems come mainly from trans-boundary conflicts that tend to destroy collaborative efforts of communities to

manage natural resource effectively (Granovetter). Cornor and Dovers have therefore advised that trans-boundary conflicts should be resolved properly. Meanwhile, Granovetter had observed that to resolve trans-boundary conflicts effectively, management institutions require ample time and adequate funding. To Fukuyama (2009), conflict management requires a legal body that shall mediate amicably all disputes among interested groups from neighbouring communities. In other words, without strong legal backing, disputes or conflicts among communities that share common resources such as drainage basins, may persist for a long time.

Theories underpinning institutional management systems

This section presents arguments on three theories which inform this study. These are: the theory of collective action (Hardin, 1968); the principal-agent theory (Eisenhardt, 2005); and the theory of natural resource conservation (Hopfoll, 2008). These theories provide the theoretical grounding for the present study. The theories are built around three main notions: the first is contractual agreement between a principal (a superior institution) and its agents (subordinate) while the second is sustainable resource management, and the third is mobilisation of collective action for local resource management.

The theory of collective action

The first theory that provides theoretical foundation for this study is the theory of *collective action*. This theory was first employed in 1968 by Hardin (1968) who studied the power of collective action in the management of common pool/property resources (Dawes, 1975). To conserve common property resources, Hardin proposed a workforce of more than one person and

advised succeeding societies to put in regulatory measures against excessive extraction.

The controlling ideas in Hardin's (1968) argument on the approaches to common pool resource management can be summarised into three major points. To Hardin, every system structured to manage a common pool, must essentially:

- have greater collective action which must come from the beneficiary of the projects;
- be controlled by agencies with stronger legal mandate to bring the desired results and
- attract maximum amount of care from its users, especially when the users are from different places.

Snidal (1985) supported the views of Hardin with the statement that “the use of common resources without care could lead a society to reap negative externalities or undesirable outcomes”. To solve the problems that might arise from such negative externalities, Snidal suggested the use of communal action. The implication of the submissions of Snidal and Hardin is that the management of community resources could be challenging, if proper mobilisation of collective action, is not taken.

Wade (1987) has noted that the amount of collective action mobilise from communities at every stage of resource management processes depends on available resources and the legal support given by local authorities to facilitate the exercise (i.e. the mobilisation effort). Kimber (1993) endorsed this views of Wade, and laid emphasis on ‘time’ as one of the most important factors that determine the effectiveness of collective action of communities.

To Kimber, when collective action is not mobilised on time, common pool resources deteriorate fast, especially, when they are used by a large number of people from different communities. Consequently, the interest of a community to support management institutions may decline, and that can affect future project development (Kimber).

The principal-agent theory

The principal-agent theory commonly known as agency theory was put forward by Eisenhardt (2005) to assess the performance of institutions that were given responsibilities to distribute public goods. According to Eisenhardt, and Jensen and Meckling (2006), in any principal-agent relationship, the agent and the principal come to an agreement on the amount of resource needed for a task to be accomplished. The agreement, according to Alexander (2009) and Lane (2005), is usually in the form of a contract in which one party accepts the responsibility to serve the other. For example, in the context of natural resource management, governmental institutions are agents that accept responsibilities to manage natural resources (drainage basins) on behalf of local users (principals).

Clark and Sharf (2007), and Colish (2009) have listed two conditions that can distort agreement between an agent and a principal. To the authors, a distortion arises when the principal fails to finish the work contained in a contract. In the absence of adequate resources, Berelson (2003), and Bergen and Walker (2007) have observed that agents execute sub-standard projects. Another distortion, according to the authors, occurs when an agent fails to identify all the possible challenges that may arise before the commencement of a project. In that case, the principal is expected to withdraw the contract, or

provide extra resources for the completion of the project (Breneman, 2004; Perrow, 2010; Simon, 2010). The refusal by a principal to withdraw a contract in such a situation has been described as 'breach of contract' by Cantor and Courant (2012) who observed that a 'breach of contract' disorganised agents, and caused them to perform poorly.

Moral hazard is another problem that arises in principal-agent relationships. Milgrom and Roberts (2004) further explained that moral hazards are communication disorders that cause an agent to act contrary to the specifications given by a superior (principal). To illustrate the effects of moral hazards in project management, the authors used the case of the agency relationship between the Shenzhen Energy Company (SEC) of China and the Coal Supply Company (CSC) of South Africa. The researchers found information filters and information overloads to be the most dangerous types of communication disorders that adversely affected the performance of the above-mentioned companies. When the problem of information filters occurred, the CSC sheltered the instructions given by SEC, and supplied a limited quantity of low grade coal. The authors also found that the Shenzhen Energy Company (SEC) gave too many instructions to its supplier, and that caused 'information overloads' which misled the agent (the coal supplier) to perform poorly. Such failures of an agent to work to expectation have been described by Ricketts (2002) and Mensah (2008) as shirking of responsibility because they see shirking of responsibilities as the major cause of incomplete project developments, especially when there are no supervisory institutions to undertake monitoring duties.

According to Auld (2010), problems of adverse selection occur in agency relationships between superiors and agents. Auld realised that whenever a superior or principal is unable to find out whether an agent has executed all details of a given task or not, problems of adverse selection arise. To solve such problems, Lane and Kivisto (2008) recommend the employment of third parties to help in the assessment of the performance (of an agent) while projects are on-going or after they have been completed. The best approach to detect adverse selection in any principal-agent relationship is to set up autonomous institutions to employ performance schemes that can help principals to detect the uncompleted parts of projects that have been assigned to subordinate management institutions (Bergen, 2002; Lane & Kivisto; Milgrom & Roberts, 2004; Petersen, 2005).

Finally, Milgrom and Roberts (2004) discovered 'goal conflict' as a third problem that occurs between agents and superiors. To the authors, goal conflict, occurs when a superior and a subordinate have common interest in a project, even at the initial stages. Lane and Kivisto (2008) similarly observed that when the problem of goal conflict becomes uncontrollable, projects are abandoned especially, when agents are unwilling to change approaches of production. Due to the numerous problems that are associated with principal-agent relationships, Lane and Kivisto have advised resource management institutions especially in developing countries to first, evaluate all project development stages for possible detection of moral hazards, adverse selection and goal conflicts before awarding contracts to agents.

The theory of natural resource conservation

The theory of natural resource conservation by Hopfoll (2008) emphasises the turn-out of high quality products through effective management of natural resources. The theory strongly supports the argument that natural resource conservation contributes immensely to sustainable development which is opposed to the view that resources should be used in the short run for immediate benefit of the present generation (King, Pizan & Milman, 2003). For this reason, Boserup (1981) accepted the stand of the World Conservation Strategy [WCS, 1980], that natural resources are to be utilised judiciously to facilitate future development.

Stewart (2009), and Kimppinen and Walls (2015) opine that conservation entails much more than saving cute and cuddly endangered species. Meanwhile, Hopfoll (2008) had proposed three goals for communities that wanted to practice conservation of natural resources. The goals were:

- First, natural resources are for man's utilisation and hence, must be used rationally. As such the main goal of conservation shall be sustainable development of resources;
- Second, conservation in essence, stands for the prevention of waste from exploitation, processing and utilisation of natural resources. Conservation therefore does not advocate a 'man-rush' for resource acquisition that could cause destructions in the future; rather, it seeks to prevent waste during resource extraction processes; and
- Third, natural resource conservation needs to be developed and preserved for the benefit of many, and not for the profit of a few.

Based on similar ideas, Pender and Ehui (2012) later outlined five (5) basic strategies for conserving natural resources that are relevant to drainage basin management. The strategies include:

- Proper allocation of drainage basin resources;
- Beneficial use of drainage basin resources;
- Forecasting and planning for the use of drainage basin resources;
- Drainage basin resource substitution; and
- Harmonious property relation.

Allocation of drainage basin resources

This strategy calls for the determination of the most appropriate use of resources. The strategy suggests that resource exploitation and utilisation shall as much as possible, avoid misuse, or mismanagement of resources (Ather, 2011). Pagiola (2013) has therefore opined that efficient allocation of drainage basin resources means adopting a plan that shall help producers to optimise benefits from inputs used in production. Pagiola added that allocation of drainage basin resources should be controlled by economic factors. He opined that it is important to allocate drainage basin resources such as the supply of water, to larger numbers of the population. He however, advised in government controlled economies, a resource should be reserved for the use that government thinks is relevant (Mckenzie, 2014).

Uses of drainage basin resources

The strategy of ensuring beneficial use of drainage basin resources requires every community to use resources in a way that shall be beneficial to everyone (Fearnside, 2007). The strategy of beneficial use of resources emphasises the responsibilities of communities to ensure that resources are

extracted judiciously for the benefit of all (Fearnside). For example, it is important and beneficial to allocate resources of a drainage basin such as water to all, or to the majority of people and not to a few (Davis, Schoorman & Donaldson, 2007; Ricketts, 2002).

Forecasting and planning the use of drainage basin resources

According to Ackon (2007), forecasting and planning the use of resources means putting in place structures to sustainably exploit resources in the future. To manage future resources sustainably, Pokharel (2000) has recommended the use of sound policies and proper institutional coordination. According to Pokharel, sound policies determine the extent to which a resource should be exploited. Pokharel suggested that resource conservation practices must embrace, or regard sustainable planning and forecasting, as foundational blocks.

Drainage basin resource substitution

Bromley (2008) suggests that the substitution of 'replaceable' for 'irreplaceable' natural resources is a sound conservation practice. Based on this suggestion, Michalak (1993) defined drainage basin resource substitution as the use of common resources in drainage basins instead of those that can go extinct for production. On this issue, Herman (2004) has advised that communities that depend on rare trees such as *mahogany* (*Khaya anthotheca*) for fuel-wood can always fall on abundant species such as *Acacia* to serve similar purposes; and to desist from the use of species such as mangroves (to produce charcoal) since they take longer periods to mature.

Harmonious property relation

This concept of harmonious property relations draws attention to the fact that there is the need for cordial relation between owners and users of natural resources to avoid over-extraction that may lead to destruction (Landell, 2005). Landell opines that users and managers of drainage basins have the responsibilities to conserve resources; however, there must be an agreement between them to avoid over-extraction (Shrestha, 2011). The implication from the above is that drainage basin user institutions must, at all cost, cooperate and use resources sustainably as cautioned by Sarker (2002) and Steins (2014) who have observed several conflicts among the users and managers of most drainage basins that lie along the coast of West Africa. Finally, Kimppinen and Walls (2015) have recommended that conservatory management systems must aim at sustainable development of natural resources now, to save nations from reaping future undesirable consequences.

Summary

This chapter has presented a review of the literature related to the structures or components of a good river basin management system. In doing that, it first suggested that a good drainage basin management system should have strong policies, better approaches, and sound principles. It listed the roles of management institutions as part of the essential components of a good river basin management system.

The discussions on the components of a good management system has shown that without the use of good management principles such as transparency, accountability, efficiency and equity, drainage basin

management institutions may not be able to meet their goals of promoting sustainable resource development.

The chapter ends with a discussion of three theories that underpin the management of natural resources. These are the Hardin's (1968) theory of collective action, the Eisenhardt's (2005) principal-agent theory, and the Hopfull's (2008) natural resource conservation theory. The analysis of Hardin's (1968) theory of collective action brought to fore the factors such as the size of a natural resource and the cost of operation as the major factors that can affect communal management of drainage basins. The principal-agent theory suggested that for a principal-agent relationship to be strengthened there must be an agreed-upon-contract that clearly specifies the roles expected of the parties (the principal and the agent) involved. The agency theory defined local communities as the principals and those institutions that are assigned to drainage basin managements, as the agents. Finally, the discussions on the Hopfull's natural resource conservation theory revealed five (5) strategies that should be adopted to promote conservation of drainage basins. Prominent among the strategies were the principles of efficient allocation, and of natural resource substitution which unfortunately have been neglected by many rural communities, especially those that adopt improper management strategies.

CHAPTER THREE

EMPIRICAL STUDIES ON DRAINAGE BASIN MANAGEMENT AND THE CONCEPTUAL FRAMEWORK

Introduction

This chapter presents the review of the available and relevant studies on the approaches that have been used to manage drainage basins. In doing so, the chapter first traces the evolution of drainage basin management policies and approaches from different parts of the world. The chapter then discusses the attempts made by Ghana (formally Gold Coast) to manage its drainage basins before the nineteenth century. In addition, an assessment of the strength and weakness of three models (frameworks) that have been used to manage drainage basins in different geographical settings are presented, and the final framework that informed the present thesis is also presented.

Evolution of drainage basin management policies

The origins of drainage basin management policies can be traced to several parallel and independent movements in many countries that concerned themselves with conservation of drainage basin resources. These include the Resource Restoration in the Alpine Mountains in Europe which started in the last quarter of the 19th Century, the Conservation Movement in the United States of America (USA) in 1930, and the Rehabilitation Activities of Colonial Governments in Africa (Maarleveld & Dangbegnon, 2008; Pahl-Wostl, 2009).

The adoption of national policies on drainage basin management became prominent in many countries between 1970 and 1980 when problems of degraded drainage basins became apparent. For example, in 1976, Indonesia created a National Drainage Basin Development Programme in

response to damages caused to the country's drainage basins (Malla, 2001). Brazil launched some Integrated Soil and Water Management Programmes (ISWMP) in the mid-1970, as a strategy to prevent soil erosion. India too formulated many policies to conserve several deteriorating drainage basins that resulted from inappropriate developments (Malla).

In 2001, the United Nations Commission on Sustainable Development (UNCSD) strongly urged governments of the world to adopt sound management policies that addressed problems relating to the drawing and conservation of fresh water (Sikka & Samra, 2001). Following the directive, drainage basin management institutions were set up in many countries to develop new policies to redress the problems inherent in traditional management approaches. These policies contained modern institutional packages that, for example, improved agricultural production in most developed countries such as Canada and Britain (Sikka & Samra). A review of the results of the implementation of similar policies in the United States, United Kingdom, France, Australia and New Zealand showed massive achievements in the areas of transportation and agriculture (Williamson, 2006). Following these achievements, environmental laws were passed to improve the management of drainage basins in developed and developing countries (Douglass, 2007). Eventually, national laws and policies on drainage basin management became essential parts of management systems in both developed and developing countries (Bootsma, Hecky, Johnson & Kling, 2003).

Institutional drainage basin management approaches

Engineering approaches characterised the first generation of institutional drainage basin management approaches in developing countries between 1970 and 1980 (Blackburn & Holland, 1998). During that time, institutional management programmes in countries such as Malawi were largely considered as technical packages with purely physical measures designed to manage soils in drainage basins of medium and large river valleys (Meadows, 2003). The objectives of such management programmes were to prevent rapid surface run-off, slow down siltation of reservoirs downstream, and to limit the incidence of potentially damaging flash flooding (Liao, 1976). Subsequently, efforts were made to provide immediate environmental protection (Roux, 2008).

By the end of 1980, failure of the engineering-led approach in drainage basin management became clear in most developing countries; International agencies therefore began to think of better approaches (Darghouth, 2008). The major option of these countries was to develop integrated management systems that would cater for the needs of local people, and address the concerns of management organisations at the same time (Magrath & Doolette, 1990). Consequently, the 'bottom-up approach' which paid much attention to the concerns of local people, came into being in the 1990s (Darghouth). That new approach was a deviation from the discriminatory 'top-down approach'. Apart from the two approaches – the bottom-up and the top-down – there came three others called sectoral, integrated, and community participatory management approaches which produced good results after they were

followed carefully by many developing countries such as Pakistan, Burma and Bangladesh (Darghouth).

Top-down institutional management approach

The top-down approach allowed national authorities to formulate plans, and implement policies without consulting local people. Terrace farming improvement projects in India, for example, were designed by government officials without the involvement of local farmers; as such they were described as top-down projects (Narwal, Singh, & Antil, 2003). One major feature of the top-down approach was that projects were financed from budgets approved by state officials (Narwal, Singh & Antil). Many soil conservation projects in India for example, failed because they had rigid technological solutions proposed by officials that were expensive to adopt (Johnson & Ravnborg, 2001; Hudson, 1991; Kerr, 2012).

Another feature of the top-down drainage basin management approach was its consideration of top managers' ideas instead of those of local people (Datta & Virgo, 2007). Reports from many programmes such as the National Drainage Basin Development Programme for Rainfed Areas (NWDPA) implemented in India in 1990, and the Soil Conservation Programme (SCP) in Brazil in the mid-1980s, caused negative feelings among the local people because of the unfamiliar method (the top-down approach) used by government management institutions (Kumar & Pretty, 2002). Project planning done solely by government, neither accommodated the interests of local communities nor attracted positive feedback (Peraz & Tschinkel, 2003). The top-down approach in countries such as India, therefore encountered

many challenges, especially when monitoring and evaluation of projects were being done by local communities (Peraz & Tschinkel).

In many West African countries, the application of the top-down approach to drainage basin management failed, in most cases. For example, in 1994, when the government of Ghana (GoG) designed a comprehensive top-down programme that gave priority to only biophysical aspects of drainage basins, it realised little achievement (Douglass, 2007). That happened because management programmes focused only on engineering works which were much more expensive to finance. The government of Ghana thereafter, saw the need to direct its attention to the use of local expertise and materials to conserve drainage basins as a way of embracing the bottom-up approach [Department of Soil Conservation and Drainage Basin Management (DSCWM), 2009]

Bottom-up institutional management approach

The bottom-up approach is a democratic process which involves local people in planning, implementation and decision making stages of community development projects (Thoruw & Juo, 2005). This approach which is a decentralised-planning and policy-formulation based has become popular in developing countries in the last two decades (Kerr, 2012). In this approach, resource management systems are built on the principle of devolution of power and authority to local communities for management, utilisation, and conservation of resources (Balogun, 2000; World Resource Institute [WRI], 2003).

As a result of the devolution of authority, natural resource management has in recent years shifted from central government authorities to local

communities in many parts of the developing world (Wagley & Ojha, 2002). This shift has led to efficient use and management of natural resources (Swallow, Johnson & Meinzen-Dick, 2001). For example, the initiation of the decentralisation policy in Nepal, and the adoption of the bottom-up approach in the early 1980 in Japan tremendously improved food production in those two countries (Japanese International Corporation Agency [JICA], 1998; Ohler, 2000; Wagley & Bogati, 1999; Wagley & Ojha, 2002).

In spite of the successes that came with the bottom-up approach, Farrington and Baumann (2003), and Johnson (2001), enumerated several associated problems. The authors observed that although the approach (decentralised drainage basin management) empowered local people to play key collective management roles, it had major disadvantages such as inequity in the sharing of resources. The implications of the findings of Farrington and Baumann and, of Johnson were that communities that put centralisation at the centre-stage of their (drainage basin) management systems must draw on local ideas, and use them in all the projects.

Sectoral institutional management approach

The sectoral approach assigns specific roles to management institutions to improve on the quality of natural resources. With this approach, resource management institutions are allowed to implement their projects separately to give priority to specific management of natural resources (Paudel, 2002). For example, when the approach was adopted by some developing countries, a number of drainage basin management institutions were assigned water-conservatory roles and others were given responsibilities to manage forest resources (Kumar & Pretty, 2002).

Between 1970 and 1980, several non-governmental and government agencies in developing countries used the sectoral approach to conserve soil fertility through activities such as *terracing*, and *contour-bunding* (Pretty & Shah, 2000; Johnson, 2001). Most governments in Southeast Asia, for example, used the sectoral approach to establish forest plantations on degraded lands (Dejene, 2003; Montgomery, Grant & Sullivan, 1995). A number of countries in South America, such as Brazil and Peru, followed the approach, and built structures to control soil erosion to reclaim degraded lands for crop production [Economic and Social Commission for Asia and the Pacific (ESCAP), 1997].

Unfortunately, the sectoral approach has been found to be unsuitable for environmental management, especially when there are too many institutions involved (ESCAP, 1997). Conflicts of interest between government agencies with different priorities are common in the sectoral approach. There are reported problems of duplication, coordination and integration of programmes (ESCAP). Paudel (2002) observed failure in many sectoral management systems that were used by countries such as India to build community projects by institutions that tried to reverse the initial processes involved (in the approach). Similarly, Shah and Schreier (1995) observed that in most cases, where the sectoral approach was used within a department, there was little coordination among the management institutions [Kumar & Bakshi, 2002; United Nations Environment Programme (UNEP), 2004]. Townsely (1996) and Ozyuvaci (1997) too observed that the sectoral method was unsuitable for project management especially in communities where competition for resources was high. This was because competition

tends to distort joint co-operation that was necessary to sustain the approach (Ozyuvaci).

Integrated institutional management approach

The integrated institutional approach to drainage basin management emerged in the United States of America in 1980, as a comprehensive planning process aimed at addressing concerns of management institutions and needs of local users of particular resources (Alaerts, 1991; Paudel, 2002). The approach was actually recommended in Agenda 21 of the Earth Summit of 1992 for effective development of projects in drainage basins (Rafaro, 2004). That recommendation was made on the assumption that, the approach produced good results from the perspective of environmental management whenever it was tried in many farming communities in several developing countries. Consequently, Blair (2003) has advised heads of management institutions to incorporate the integrated management approach at all planning and implementation stages of projects. The advice given by Blair was based on the fact that, the integrated approach ensured reliable and continuous flow of resources and information from institutions at the national level to those at the regional and district levels.

Rafaro (2004) has suggested that there should be a strong governance system that should hold all processes and policies in the sectoral approach to enhance effective delivery of services. With such an approach, his report required sound levels of coordination at the top and at the local management levels (Hartvelt, 1996). Rafaro further suggested that the institutions charged with drainage basin management must be strengthened in terms of capacity for operation. This was because the integrated drainage basin management

approach functioned effectively when institutions were provided with funds or logistics, and were given legal backing to execute managerial duties (Ewards, 1993). As such, Israel, Lorrain and Kumari (1997) advised nations that wished to adopt the approach to have strong legal basis to support their institutions to share resources equitably with pro-poor communities.

Finally, Rafaro (2004) has identified monitoring and evaluation as the two important processes that galvanise the integrated approach to yield the desired results. The two processes, according to Rafaro, assist drainage basin management institutions to solicit information for future project development.

Community-participatory management approach

Community-participatory management approach has been defined by Arthur and Moore (1999) as a process of creating and using community self-supporting systems at various stages of environmental management. Cohen and Uphoff (1980) opine that community participation should include people's involvement in decision-making, implementation, monitoring and evaluation of programmes and the sharing of proceeds of projects.

The preliminary stage in the participatory drainage basin approach entails the identification of (concern) institutions that try to establish dialogue with local people (Dukes & Firehock, 2001). Subsequent stages are those for the identification of the basic drainage basin problems (to be solved), and the assessment of resources available for project development (Dovers & Dore, 2003). Leach and Sabatier (2002) too opine that initial implementation of policies must be followed by a system of monitoring and evaluation to enable local people to follow, and measure project developments whenever the participatory approach is used. Meanwhile, Sommarstrom (2000) had

suggested that participatory drainage basin management should provide opportunities for stakeholders to negotiate their interests, and to suggest priorities that should bring benefits to all.

The implication of the above is that, for participatory planning to be successful, the implementation phases should be preceded by policy formulation and implementation that effectively prepare the ground for efficient management (Sabatier, Pelkey, & Leach, 2002). In other words, monitoring and evaluation by local people must form integral part of the entire participatory process. Martin (2008) has listed the following as advantages of the approach:

- Arrest free-riders during management operations,
- Mobilise financial resources from communities, and
- Give balanced attention to all groups, irrespective of class, gender, creed, or tribe.

In spite of the advantages, there are certain problems that militate against successful implementation of programmes in the participatory management approach. For example, Martin (2008) has identified delay in decision-making and policy formulation, and over-reliance on local ideas as the associated problems.

Overview of drainage basin management in Ghana

Before the twentieth century, drainage basin management in most Ghanaian communities was done using indigenous knowledge or religious-based restrictions (Bullock, 2014). At that time, drainage basin management approaches mainly involved the use of taboos to deter people from encroachment (Opoku-Agyemang, 2008). These restrictions were, to a large

extent, dependent on the fear or respect for religion, and on local and cultural norms for the protection of the environment (Odame-Ababio, 2010).

Unfortunately, the advent of Christianity, western education, urbanisation and the desire to develop resources in most communities eroded the effectiveness and respect for the so-called traditional norms devised at the time (Opoku-Agyemang, 2008). Afterwards, customary administration over drainage basins met lots of challenges giving way to illegal uses of drainage basin resources (Gibson, 2001). In the face of the numerous problems encountered through the administration of the customary laws and practices, the government of the then Gold Coast (now Ghana) resorted to the enactment of state laws and policies to strengthen the mandates of institutions managing river basins in the country (Blackburn & Holland, 1998). The first comprehensive attempt made was the enactment of the *Rivers Ordinance Act (CAP 226 of 1903)* to regulate the exploitation of degraded basins. Section 10 of the Ordinance stated that “It shall be unlawful to pump, divert, or by any means, cause water to flow from any river, for the purpose(s) of large scale irrigation, mining, or to generate power without a license from the appropriate quarters”. Unfortunately, there was no follow-up measure to strengthen the Act which then was overtaken by events and other enactments that contained specific provisions that enabled agencies to perform the functions related to drainage basin management (Bossman, 1998).

The *Forestry Ordinance of 1927*, for example, was enacted for catchment protection, and control of water abstraction from forest reserves. It was followed by the *Land Planning and Soil Conservation Ordinance of 1953* which contained provisions for reducing soil erosion along *watercourses*. At

that time, national laws were silent on drainage basin management because more emphasis was on local bye-laws that laid emphasis on community resource development (Odame-Ababio, 2010). Though many of such local laws were implemented, the challenges in drainage basin management still continued to increase (Odame-Ababio). As such, it became crucial for government to bring on board effective drainage basin management approaches or policies.

After independence in 1957, the Government of Ghana, by an *Act of Parliament (Act 522 of 1996)*, established the WRC and empowered it with superior mandate to enforce the Integrated Water Resource Management (IWRM) and the Water Use Regulation LI 1962 of 2001 Policies (Opoku-Agyemang, Micheal, Manu, & Bossman, 1998). That attempt led government to move from the strict protection to the Integrated Management Approach that allowed local communities to use drainage basins resources. Unfortunately, the objectives of government after the implementation of the Integrated Drainage Basin Management Policy were not realised due to several problems related to institutional capacity for operation. Later in 2012, the government formulated the Nation Buffer Policy to ensure safe development of drainage basins in regions that had high population growth, and in areas where increase in population threatened management of drainage basins. Specifically, the Nation Buffer Policy was instituted to help Ghana to meet Target 7 of the Millennium Development Goal 7 which had been enjoining member countries to protect water bodies (including drainage basins) for future use (Amakye, 2012). Table 2 shows details of the historical

development of policies on drainage basin management in Ghana from 1903 to 2012.

In spite of the recent policy interventions and approaches adopted for drainage basin management by successive governments of Ghana, there are still weaknesses and major gaps in the implementation and attainment of the objectives (Kling & Mwita, 2013). This has made it crucial for government to take bold steps to protect the nation’s drainage basins.

Table 2: Drainage Basin Management Policies in Ghana from 1903 to 2012

Year	Laws/Policies formulated	Goals to be achieved
Before Twentieth Century	Religious-based Restrictions	Deter people from encroaching on drainage basins
1903	Rivers Ordinance	Regulate the exploitation of degraded basins
1927	Forestry Ordinance	Catchment protection and control of water abstraction in forest reserves
1953	Land Planning and Soil Conservation Ordinance	Checking soil erosion and the control of watercourses
1996	Integrated Water Resource Management Policy (IWRMP)	Promote sound cooperation among water resource users and managers
2001	Water Use Regulation LI 1962 of 2001 Policy	Streamline the administration and governance over local water bodies license drilling
2006	Drilling for Water and Groundwater Regulation Policy LI of 1827	Ensure safe development of drainage basin resources
2007	The National Buffer Zone Policy	Prohibit the development of programmes to safeguard basin resources
2012	The National Water Vision Policy	Comprehensively manage the nation’s drainage basins

Source: Author’s Compilation (2016)

Currently, the Government of Ghana has taken a step to merge the National Water Vision Policy with the Small-scale Mining Law, Act 703, PNDCL 218 of 1989, to control all environmental-damaging activities, especially by small-scale mining operators in drainage basins (Amakye, 2012). With that arrangement, the Government of Ghana hoped to protect, and restore aquatic ecosystems in river basins to meet Target 6 of the Sustainable Development Goal (SDG) 6.

Role of local government in drainage basins' management in Ghana

Under the *Local Government Act 462 (1993)* of Ghana, Metropolitan, Municipal and District Assemblies (MMDAs) are the highest political and administrative authorities in the localities with the mandate to promote productive activities and social development on behalf of the national government (Aryee, 2008). The administration over drainage basins is also vested in the hands of the MMDAs under Section 11 of the *Water Use Regulation Act of 1962* of 2001 (Opoku-Agyemang, 1998).

Where several water bodies and basins straddle more than one district, unsustainable uses in one district may affect the riparian districts; such situations calls for the intervention of the District Assembly to initiate programmes that should bring mutual benefit to the parties concerned (Mensah, 2005). Partap and Watson (2006) proposed that trans-district drainage basin management should be perceived in terms of interconnection of watercourses within a basin. In this case, the establishment of joint institutions by districts to facilitate cooperation on relevant measures and procedures in the light of experience and capacity of the district assemblies ensure sustainability of trans-boundary drainage basins (Rasul & Karki, 2007). The principles of equitable

utilisation of watershed resources, and the obligation not to cause harm to riparian communities should guide MMDAs to advise the Water Resource Commission to grant drainage – basin-use rights (Putnam, 2008).

In the organisational structure of the decentralised system of Ghana, MMDAs have been empowered to mobilise funds from local communities to support development of projects towards drainage basin management (Mensah, 2004). In addition, the MMDAs have been given the mandate to educate communities on the proper ways of handling drainage basin resources (Ministry of Works and Housing, 2010).

Empirical review of drainage basin management approaches and experiences of some countries

This section presents a summary of some studies on notable approaches that have been used for drainage basin management by some developing countries, from 2000 to 2015. The review was limited to the period of 2000 and 2015 because this was the time when major approaches to drainage basin management emerged in countries that paid much attention to generate much resources from their drainage basins. This section focuses more on the results of the approaches with special references to those used for managing some important river basins in Ghana (Table 3). The review or outline was done to:

- identify the empirical gap in the approaches to drainage basin management. The gap supports the problem statement as it brings to bear the existing approaches and the expected one that can help nations across the world to solve the major challenge(s) in drainage basin management,

- help the researcher to identify the methodological strengths that underpinned the selection of the ideal, or the most appropriate research methods (sampling, data collection and analytical techniques); and
- guide the drawing of sound conclusions for the present study.

Drainage basin management approaches and experiences from South America

Plummer and Slaymaker (2007) investigated the Ethical Management Approach that was used to manage drainage basins in Bolivia, Brazil, Argentina and Peru in South America. With the use of semi-structured interview guides, the study gathered information from women and children on the best strategies to incorporate ethical values in management systems for major river basins in the countries. The views of the women and children interviewed, indicated that about 90 percent of local management institutions in the selected countries implemented policies that prevented the vulnerable groups (that is the poor, the aged and traditional worshippers) from getting access to drainage basin resources. The authors observed that the local management institutions never created proper channels (i.e. platforms and communication routes) for the weaker groups to share their concerns about the poor ethical management strategies.

A year after the study of Plummer and Slaymaker (2007), the Community Participatory Approach became highly favoured in management cycles of several drainage basins in South America. In particular, the principles in the approach guided all developmental activities of drainage basin managements. It was during this time that Martin's (2008) study on the

participatory approach became famous, as it took a quantitative approach (rather than the normal qualitative approach) to assess the involvement of 400 community users of the Orinoco River Basin in Venezuela in decision-making, policy formulation and implementation, monitoring and evaluation stages.

Complaints received from 90 percent of the sampled respondents (the users) in the study confirmed that, officials of the Orinoco River Basin management institutions coerced community users to participate in activities at some stages. The result was that whereas the users made valuable contributions during decision-making they abstained from making any suggestion when it came to monitoring and evaluation stages of the management. Because of that outcome, Martin (2008) cautioned the stakeholders who wish to promote the Community Participatory Approach to desist from coercing local communities to participate in management.

Drainage basin management approaches and experiences from Asia

As a result of the problems that emanated from the use of the Ethical Management Approach and the Community Participatory Approach in South America, the World Bank (2009) conducted some studies that would lead to the acceptance of the Accountability Management for managing drainage basins. The main objective was to determine the pathways to be followed by communities living along rivers to make demands from local management institutions.

During the studies, a number of heads of community-based drainage basin management institutions (in South Korea, Pakistan and India) were interviewed on measures that they had put in place to ensure that information

on resources provided by government were displayed at various stages of management to the local communities. The results were that about 75 percent of users of drainage basins in each of the three Asian countries used inappropriate channels to report their concerns about how accountability was ensured. The World Bank (2009) in fact noticed that majority (about 78 percent) of the users were not properly educated on their rights, and on the appropriate channels to demand accountability from community-based management institutions. It was therefore recommended that proper education of local communities must come first before the Accountable Management Approach is practiced.

In 2009, the Millennium Assessment Group conducted a related study to evaluate the effectiveness of the use of the Demand-driven Approach in distributing resources of the Indus River Basin in Pakistan. The main objective of the organisation was to identify the factors that drove excessive demand for resources of the basin, and to make wealthy suggestions to control them in support of the management of the basin.

The study used the multi-stage sampling technique to select 300 inhabitants of Indus, a cosmopolitan city in Pakistan that had an annual population growth of 3.9 percent and to seek for their views on the factors that pushed them to demand large quantities of resources from the Indus River Basin. The results of the study revealed that about 89 percent of the local inhabitants had multiple uses for the resources of the basin; as such, they were ready to purchase resources at any price. That situation gave the local management institutions the opportunity to increase taxes on the high demand to support management and development of the basin's resources.

Nonetheless, after a critical assessment of the resource holding capacity of the basin, the Millennium Assessment Group (2009) cautioned the institutions in charge of management based on the following observations:

- First, the organisation predicted that the fast rate of population growth increased consumption of basins resources.
- Second, the organisation observed that whenever access to the use of the basin's resources increased, problems of the management institutions that should arrest trespassers also increased. The situation, according to the Group increased competition and needless destruction of the basin's resources.

Drainage basin management approaches and experiences from Africa

When traditional or customary-based approaches used to manage drainage basins in Africa failed, a search for better community-based participatory approaches was made by most African countries (Opoku-Agyemang, 2001; Water Resource Commission, 2000). Women were identified as key economic agents who could support drainage basin management. This led to the search for the roles that women could play to support rural-based management institutions.

Soon after the above observations were made, the United Nations Development Programme (UNDP) and the Gender and Water Alliance (GWA) (2006) conducted studies on the Gender Mainstreaming Approach to drainage management in Uganda, Zimbabwe, Togo and Tanzania, to assess the efforts that had been made by local institutions to give opportunity to gender groups to support management activities. Results of the studies were that state management institutions were most of the time, reluctant to give better

opportunities to women to support management operations. As a result of that women became reluctant to participate in all the stages of decision-making. The approach did not last longer. Because of that, the UNDP and the GWA advised local institutions in the selected countries to pay particular attention to all gender groups at all stages of project development.

Later on, Plummer and Slaymaker (2007) focused on the benefits of using Public-private Partnership Approach in the management of some selected river basins in West Africa. Using the mixed method approach, the two researchers employed focus group discussions (FGD) guides and questionnaires, to assess the impacts of the Public-private Partnership Approach on the development of drainage basin resources. The study revealed that about 80 percent of State Management Institutions failed to do their duties to make the approach work in support of livelihood activities that depended on drainage basin resources. They abandoned their duty when private organisations came in to render support. The authors also observed that incompetence of state management institutions was covered up when the non-governmental organisations (NGOs) came in to support.

Though the approach failed, the researchers advised the governments of the selected nations to encourage public-private partnership for drainage basin management since private institutions were duty-conscious, fast, and committed to support state institutions.

Drainage basin management approaches and experiences in some regions of Ghana

In 2000, the Water Resource Commission of Ghana conducted a research on the extent to which indigenous knowledge had been employed by

institutions responsible for managing the Gosoa River Basin in the Brong-Ahafo Region of Ghana.

Using the convenience and the purposive sampling methods, the WRC (2000) of Ghana selected some heads of community-based institutions, and solicited for their views on the best ways of incorporating indigenous knowledge into management programmes for the Gosoa River Basin. The outcome of the study revealed that management institutions in the districts ignored or under-rated the suggestions that were given by the local people. Instead, they employed some engineering approaches designed by experts from top Ministries. Consequently, the Indigenous Knowledge Approach failed because the local people did not support the programmes in the approach. Since then, the WRC has anchored the use of indigenous or local ideas to conserve drainage basin resources in every district of Ghana to follow the steps of countries such as India that became successful with the approach.

A year after the research conducted by the Water Resource Commission of Ghana, Opoku-Agyemang (2001) investigated the extent to which customary laws had been used by local management institutions in the Volta River Basin in Ghana. The main objective of the study was to find out whether the use of customary laws was the best approach to manage the Volta River Basin.

A series of in-depth interviews with chiefs and heads of local management institutions revealed that there was a high rate of unemployment among the local people living in the Volta River Basin, and that made it difficult for management institutions to prevent them from working in the basin. Hence, the use of the Customary Law Approach to deter local users of

the basin did not yield any positive results. The author therefore made the following recommendations to government. He advised government to either:

- Provide alternative jobs for local communities before enforcing customary laws to conserve drainage basin resources; or
- Set up an autonomous body to enforce compliance to drainage basin management laws and regulations in the interest of all. Either of these two recommendations, according to Opoku-Agyemang, could work to control activities such as illegal fishing, farming and sand winning in the Volta River Basin.

Starting from 2010, researches on proper institutional arrangements and sound levels of collaboration to manage river basins emerged in many regions of Ghana. For instance, Odame-Ababio (2010) devoted much attention to the study of the levels of coordination that existed among institutions in charge of the management of the Densu and the White Volta River basins. Odame-Ababio realised that the institutions in charge of management became disorganised because they were assigned intertwined roles by higher authorities. The situation, according to the researcher, led to poor co-operation among the local management institutions. Odame-Ababio therefore advised heads of local institutions to promote sound institutional linkages in order to improve performance for the achievement of management objectives.

Four years after Odame-Ababio's (2010) study on collaborative institutional arrangements, a related study by Mireku (2014) focused on the strengths and weaknesses of the Multiple Approach in managing the Inchaban River Basin in the Western Region of Ghana. The researcher observed that when the Multiple Approach was used to manage the basin, the functional

linkages among the institutions became disorganised. It was also noted that the application of many management approaches led to legal pluralism, which consequently messed up the focus of the individual management institutions, making them unsuccessful. As such, the author urged local heads of the river basin institutions to adopt any of the single management approaches such as the top-down, the sectoral, or the bottom-up, to block all channels that opened up their management systems to legal pluralism and its adverse effects.



Table 3: Summary of studies on drainage basin management approaches from 2000-2015

<i>Drainage basin management approaches and experiences from South America</i>					
Author & Year of publication	Location/ Region of study	Issue investigated & Main focus	Research: Approach & Sampling Method	Data collection & Analytical Methods	Main findings & recommendation
1. Plummer and Slaymaker (2007)	Basins in South America	<i>Main focus:</i> Ethical Management Approach to drainage basin management	<i>Research Approach:</i> Quantitative	<i>Data collection Method:</i> Use of semi-structured interview guides to solicit the views of women and children in river basins	<i>Main finding:</i> Limited access was given to the vulnerable groups to utilise resources in river basins and that took away the participation of these groups in management
		<i>Issue investigated:</i> Access given to vulnerable groups to use basin resources	<i>Sampling Method:</i> employed the simple random sampling technique to select vulnerable groups in poor communities	<i>Analytical Method:</i> use of percentages	<i>Recommendation</i> Local management institutions advised to increase access of women and children to support project developments
2. Martin (2008)	Orinoco River Basin in Venezuela in South America	<i>Main focus:</i> Community Participation Approach	<i>Research Approach:</i> Quantitative	<i>Data collection method:</i> Use of semi-structured interview guides to solicit information from local inhabitants	<i>Main Finding:</i> heads of management institutions coerced users to participate in management causing project failure
		<i>Issue investigated:</i> Strategies of promoting community participation in drainage basin management	<i>Sampling method:</i> use of the snowball sampling technique	<i>Analytical Method:</i> Use of percentages	<i>Recommendation:</i> Persuasion increases local drive and support for drainage basin management

Table 3: *continued*

<i>Drainage basin management approaches and experiences from Asia</i>			
Author & Year of publication	Location/ Region of study	Issue investigated & Main focus	Main findings & recommendation
		Research Approach & Sampling Method	Data collection & Analytical Methods
1. The Millennium Assessment Group (2009)	Indus River Basin in Pakistan, Asia	<p><i>Main focus:</i> Demand-driven Approach to drainage basin management</p> <p><i>Research Approach:</i> Quantitative</p>	<p><i>Data collection Method:</i> Use of questionnaires and in-depth interview guides (IDIs) to solicit the views of users</p> <p><i>Main finding:</i> When population of the cities increased, competition among users became high and demand for river basin resources also increased</p>
		<p><i>Sampling Method:</i> employed the multi-stage sampling technique to select inhabitants in the outskirts of cities</p> <p><i>Analytical Method:</i> use of frequencies and percentages</p> <p><i>Recommendation:</i> Population control measures can be used to reduce demand, and promote conservation of basin resources</p>	
2. World Bank (2009)	The Han River Basin in South Korea; the Kabul River Basin in Pakistan; and the Ganga River Basin in India	<p><i>Issue investigated:</i> Factors that drive demand for drainage basin resources</p> <p><i>Main focus:</i> Accountability Management Approach</p> <p><i>Research Approach:</i> Qualitative</p>	<p><i>Data collection method:</i> Use of semi-structured interview guides to solicit information from local management institutions</p> <p><i>Main Finding:</i> - Local users reported their worries to political-party representatives instead of management institutions</p> <p><i>Recommendation:</i> management institutions urged to educate communities on proper ways of demanding accountability</p>
		<p><i>Sampling method:</i> use of the purposive sampling technique to select community based organisations</p> <p><i>Analytical Method:</i> Content and thematic analysis using manual transcription</p>	
		<p><i>Issue investigated:</i> Methods of managing the drainage basins using the accountable management approach</p>	

Table 3: continued

Drainage basin management approaches and experiences from Africa

	<i>Main focus:</i>	<i>Research Approach:</i>	<i>Data collection Method:</i>	<i>Main finding:</i>
1. United Nation Development Program [UNDP] Gender and Water Alliance [GWA] (2006)	Some selected river basins of Togo, Uganda, Zimbabwe and Tanzania	Mixed method (qualitative and quantitative)	Use of IDIs, FGDs and questionnaires to solicit the views of women on the use of gender approaches	Government had inadequate resource to put in structures to promote gender mainstreaming in management
	<i>Issue Investigated:</i> Access given to vulnerable groups to use basin resources	<i>Sampling Method:</i> employed random and purposive sampling methods to select men & women in river basin communities	<i>Analytical Method:</i> Use of content and thematic analysis and percentages	<i>Recommendation:</i> Government should supply adequate resources especially at the local level to support men and women in management
2. Plummer and Szymaker (2007)	Some selected river basins in Six (6) developing countries in Africa	Mixed (Qualitative & Quantitative)	Use of FGDs and questionnaires to gather information from local inhabitants	Government institutions had legal capacity to operate but were under resourced, and not duty-conscious unlike the NGOs.
	<i>Issue investigated:</i> Benefits of private partnership in drainage basin management	<i>Sampling method:</i> use of the snowball sampling technique	<i>Analytical Method:</i> Use of percentages and frequencies	<i>Recommendation:</i> State management institutions must draw a support of private institutions to be efficient

Table 3: *continued*

<i>Drainage basin management approaches and experiences in some regions of Ghana</i>					
Author & Year of publication	Location/ Region of study	Main focus/Issue investigated	Research approach Sampling method	Data collection method & analytical method	Main findings/ recommendation
1. Water Resource Commission (WRC) and the Ministry of Works and Housing (2000)	Gosoa District, Brong-Ahafo Region of Ghana	<i>Main focus:</i> Indigenous Knowledge Approach to drainage basin management	<i>Research approach:</i> pragmatist (Qualitative & Quantitative)	<i>Data collection method:</i> Focus Group Discussion Guides (FGDGs) and semi-structured interview schedule were used to solicit views of community users of the drainage basins	<i>Main finding:</i> Local institutions adopted the top-down approach and neglected the views of local people in project management.
		<i>Issue investigated:</i> approaches to incorporate indigenous knowledge into management activities	<i>Sampling Method:</i> use of the purposive and convenience sampling techniques to select institutions and users	<i>Analytical Method:</i> Use of percentages and frequencies	<i>Recommendation:</i> Top management institutions must task local institutions to incorporate local ideas into management
2. Opoku-Agyemang (2001)	Volta River Basin, Volta Region of Ghana	<i>Main focus:</i> Customary-Law Approach to drainage basin management	<i>Research approach:</i> Qualitatively selected institutional heads and local community users of the drainage basin	<i>Data collection method:</i> Use of in-depth interview guides to solicit information from local management institutions	<i>Main Finding:</i> local management institutions had weak legal capacity to enforce community by-laws
		<i>Issue investigated:</i> adherence to customary laws to manage drainage basins	<i>Sampling method:</i> Use of simple random and purposive sampling method to select users and managers of river basin resources	<i>Analytical Method:</i> Use of percentage, means, frequencies and standard deviation	<i>Recommendation</i> Government urged to establish local by-law enforcement agencies that will solely be in charge of persecution of illegal users of river basin resources

Table 3: continued

Drainage basin management approaches and experiences in some regions of Ghana					
Author & Year of publication	Location/ Region of study	Main focus/Issue investigated	Research approach Sampling method	Data collection method & analytical method	Main findings/ recommendation
3. Odame-Ababio (2010)	Densu (Gt. Accra) and White Volta (Volta) River Basin, Ghana	<i>Main focus:</i> collaborative governance for drainage basin management <i>Issue investigated:</i> Institutional linkages among drainage basin management institutions	<i>Research approach:</i> Qualitative <i>Sampling method:</i> Used systematic and convenience sampling techniques to select stakeholders of river basin management	<i>Data collection method:</i> Employed IDIs to solicit information stakeholders of river basin management <i>Analytical Method:</i> Use of percentages and frequencies	<i>Main finding:</i> Local management institutions had diffused state of roles and functions <i>Recommendation:</i> Local institutions must be tasked by government to improve levels of collaboration, supervision, consultation among others
4. Mireku (2014)	Inchaban Drainage basin, Western Region, Ghana	<i>Main focus:</i> Multiple Approach to drainage basin management <i>Issue investigated:</i> Evaluation of the effectiveness of the use of the Multiple Approach to drainage basin management	<i>Research approach:</i> Qualitative <i>Sampling Method:</i> Employed non-probability sampling methods to select heads of river basin management institutions	<i>Data collection method:</i> IDIs to Solicit the views of heads of river basin management institutions <i>Analytical Method:</i> Use of content analysis and thematic and content analysis to evaluate the multiple approach to drainage basin management	<i>Main Finding:</i> The use of the multiple approach to drainage basin management caused the problem of legal pluralism <i>Recommendation</i> Local heads of river basins were urged to adopt single management approaches to avoid a mixed up in management

Source: Author's Compilation (2016)

Conceptual framework for the study

The conceptual framework (Figure 3) that has been used in this study was derived from three frameworks that were developed around different management approaches to conserve natural resources. These frameworks are the Principle of Good Governance Framework developed by the United Nations Development Programme (UNDP) and the Sustainable Human Development (SHD) in 1997, the Integrated Water Resource Management Framework by the Ghana WRC (2000), and the Accountability Framework by the World Bank (2004). The following discussions are on the strength and weaknesses of the three frameworks which informed the present researcher to adapt a conceptual framework for the present study.

The Principle of Good Governance framework

The Principle of Good Governance Framework (PGG-framework) (Table 4) was developed by the United Nations Development Programme (UNDP) and the Sustainable Human Development (SHD) in 1997 as a tool to evaluate the standard of good governance in resource distribution in fragmented societies. Due to its usefulness as a governance model, the PGG framework has been used by the Department of Environment and Heritage Protection (DEHP) of Australia (2005) to develop workable management policies to support organisations to work efficiently.

The Principles of Good Governance Framework (Table 4) has five important elements which are legitimacy and voice, strategic vision, performance, equity, and fairness that underpin the findings of the present study. The details or elements in the framework and their definitions as documented by the UNDP and the SHD (1997) are presented in Table 4.

Table 4: The UNDP and the SHD (1997) Principle of Good Governance framework

The Five Good Governance Principles	Dimension of the Principles of Good Governance
1. Legitimacy and Voice	<p>Participation – all men and women should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their interest. Such broad participation should be built on freedom of association and speech, as well as capacities to participate constructively.</p>
2. Strategic Vision	<p>Consensus building – mediates differing interests to reach a broad consensus on what is in the best interest of a group and, where possible, on policies and procedures.</p> <p>Direction – leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical and cultural complexities that affect future outcomes.</p>
3. Performance	<p>Responsiveness – institutions set up to serve all stakeholders.</p> <p>Effectiveness and efficiency – processes and institutions produce results that bring satisfaction to all.</p>
4. Transparency	<p>Transparency – transparency is built on the free flow of information. Processes, institutions and information are directly accessible to those concerned with them.</p>
5. Fairness	<p>Equity – all men and women have opportunities to improve or maintain their well-being</p> <p>Rule of Law – legal frameworks should be fair and enforced impartially on some particular human right laws</p>

Source: The United Nations Development Program (UNDP) and the Sustainable Human Development (SHD) (1997)

The following explains the features or the governance structures in the PGG framework that give it the credibility for adaptation for the present study. First, the PGG framework showcases legitimate authority of management institutions, and the voice of local communities as the two important bodies that work simultaneously to promote smooth governance of natural resources. To emphasise legitimacy and voice, the PGG framework provides two pathways that are the direct and indirect routes that should be followed by management institutions to satisfy local users of natural resources. Going by the direct route, users of resources should take their assessments on the performance of local resource management institutions straight to top institutions. Alternatively, local users may channel their complaints about performance of management institutions through legitimate intermediaries who should forward the complaints to higher authorities.

The above observations are supported by Bellamy, Ewing and Meppem (2002) who opine that the introduction of intermediaries or stakeholders in any resource management system is a way of giving opportunity to local communities to contribute valuable ideas towards project management, promote fairness in decision making, and to facilitate consensus building.

The second important feature of the PGG framework is that it stresses the need for resource management institutions to have strategic vision to guide them while operating. As such, the framework helps resource management institutions to understand, and to trace the history of complexities in other management setups, to enable them to develop workable policies for the achievement of future goals.

Finally, the PGG framework stresses the need for institutions to integrate performance, transparency and fairness into project management systems. For example, it shows how the integration of transparency into management systems can help to promote fairness, and to support institutions to respond appropriately when sharing natural resources (UNDP, 2009).

Despite its strength, the following amendments have been made to redress the weaknesses of the PGG framework, to meet the first objective of the present study which is to investigate the institutional dynamics for managing the Lower Ankobra River Basin. The first minor weakness of the PGG framework is that it has legitimate authority as the only determinant of institutional capacity for management whereas several resource analysts such as Mahiri, Mensah and Owusu (2015) have identified technical, managerial, and financial resources as other factors that determine the capacity of management institutions. According to Mahiri et al., when institutions are better resourced (in terms of funds, time and logistics) their capacities are improved and they are able to work efficiently. As such, the PGG framework has been modified slightly to include financial and technical capacities of the various management institutions in the present work.

The second minor weakness of the PGG framework is that it does not indicate the roles that management institutions should play to support resource development. To properly show their roles and responsibilities, management institutions have been positioned strategically in the adapted framework, and all important linkages that should exist among them have been indicated. These linkages are included to enable the present researcher to address the demands of the third research question of the present study which is: how

functional are the networks that should support the local institutions to manage the Lower Ankobra River Basin?

The third limitation of the PGG framework (Table 4) is that, it fails to place resource management processes into a properly-structured administrative system, even though Olsson and Folke (2001) have stated that for any resource management system to produce good results, it must be controlled by a properly-organised governance structure that ensures free flow of information. The implication from the above is that a supportive governance structure helps in the identification of possible constraints (whether human or procedural) that may impede free flow of resource to management institutions.

Integrated Water Resource Management Framework

The Integrated Water Resource Management Framework (IWM framework) (Figure 1) developed by the Ghana Water Resource Commission in 2000, is the third framework that has been adapted for the present study. The choice of this conceptual framework is informed by the definition of Integrated Water Resource Management as a comprehensive multi-resource management planning process that involves all stakeholders within a management system. Stakeholders in water resource management are expected to work together to identify the approach that is environmentally friendly and economically sustainable (Botero, 1986; United Nation Environment Programme [UNEP], 2004).

The IWM framework (Figure 1) was designed to solve diffused functions and mandates of institutions concerned with water resource management in Ghana. In the framework is the WRC, an autonomous

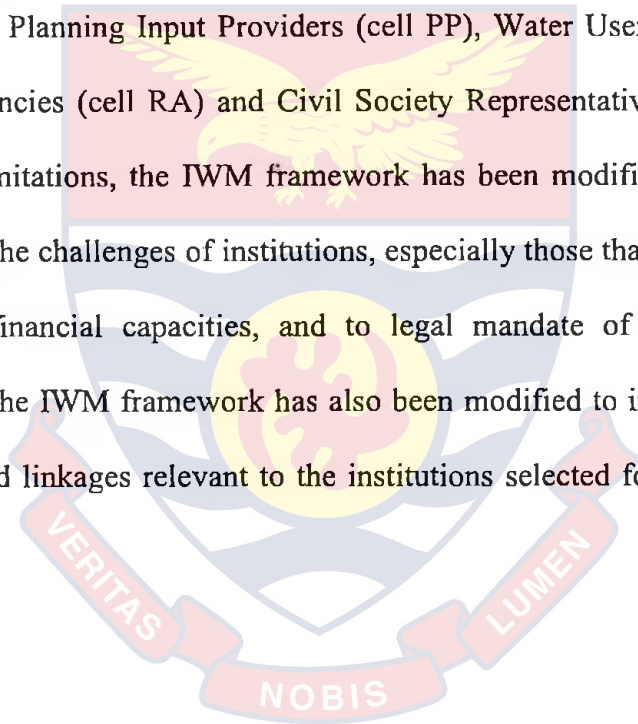
institution that has been given superior mandate to implement policies and allocate water resources to users. To support the work of the WRC (cell WC), the National Development Planning Commission (cell NP) and the Ministry of Works and Housing (cell MW) have been strategically placed to coordinate national development plans, and to formulate national water policies respectively. Furthermore, the framework indicates the supervisory roles the WRC plays in the activities of its subordinate management institutions [such as the Water Research Planning Input Providers (cell PP), Water Users (cell WU)], Regulatory Agencies (cell RA) and Civil Society Representatives (cell SC). The roles and responsibilities of these subordinate institutions (cells PP, WU, RA and CS of Figure 1) help the WRC to regulate the use of water resources in every region of Ghana.

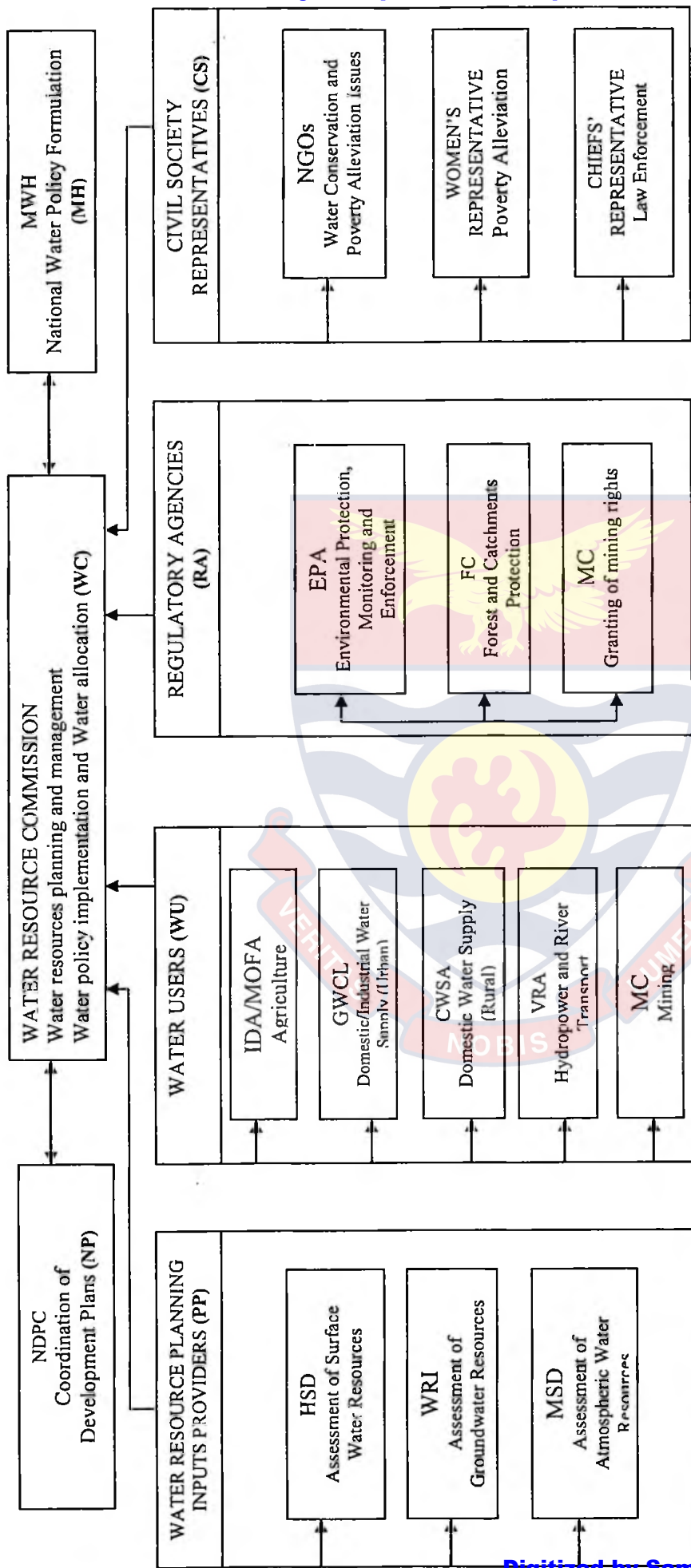
The IWM Framework has two major strengths that make it legitimate to be adapted for the present study. First, it identifies the roles (policy formulation, law enforcement, resource planning and allocation, surface water assessment and forest protection) that are absent in the earlier models. Furthermore it assigns specific roles to institutions responsible for managing water resources (such as the Lower Ankobra River Basin). It also helps in the evaluation of the roles of, for example, NGOs and civil society groups play in the management of watersheds.

Due to its strengths, the Integrated Water Resource Management framework has been used extensively in several projects related to water resource management in Ghana. For example, the framework has been used as a building block to improve rural livelihoods by the Ministry of Works and Housing in collaboration with the Water Resource Commission (2000).

Opoku-Agyemang (2001) too employed the framework to assess the effectiveness of customary laws and policies in integrated water resource management in Ghana and Odame-Ababio (2010) used it to study institutional linkages among stakeholders involved in water resource management in the Densu and the White Volta river basins.

In spite of its usefulness, the IWM framework, fails to identify institutional challenges which are conspicuous in integrated management of natural resources (Drigo, 2001). It does not also show the linkages between Water Research Planning Input Providers (cell PP), Water Users (cell WU), Regulatory Agencies (cell RA) and Civil Society Representatives (cell SC). Due to these limitations, the IWM framework has been modified to include information on the challenges of institutions, especially those that relate to the technical and financial capacities, and to legal mandate of management organisations, The IWM framework has also been modified to include all the relationships and linkages relevant to the institutions selected for the present study.





National Development Planning Commission (NDPC), Water Resources Commission (WRC), Ministry of Work and Housing (MWH), Hydrological Services Department (HSD), Water Research Institute (WRI), Meteorological Service Department (MSD), Irrigation Development Authority (IDA), Ministry of Food and Agriculture (MoFA), Ghana Water Company Limited (GWCL), Community Water and Sanitation Agency (CWSA), Volta River Authority (VRA), Mining Commission (MC), Environmental Protection Agency (EPA), Forestry Commission (FC).

Figure 1: Integrated Water Resource Management Framework
Source: Water Resource Commission (2000)

World Bank Accountability Framework

The World Bank’s (2004) Accountability Framework (Figure 2) is the third framework that has been adapted for this study. The World Bank Accountability Framework (WBA-framework) was developed to assess the level of accountability in public management systems.

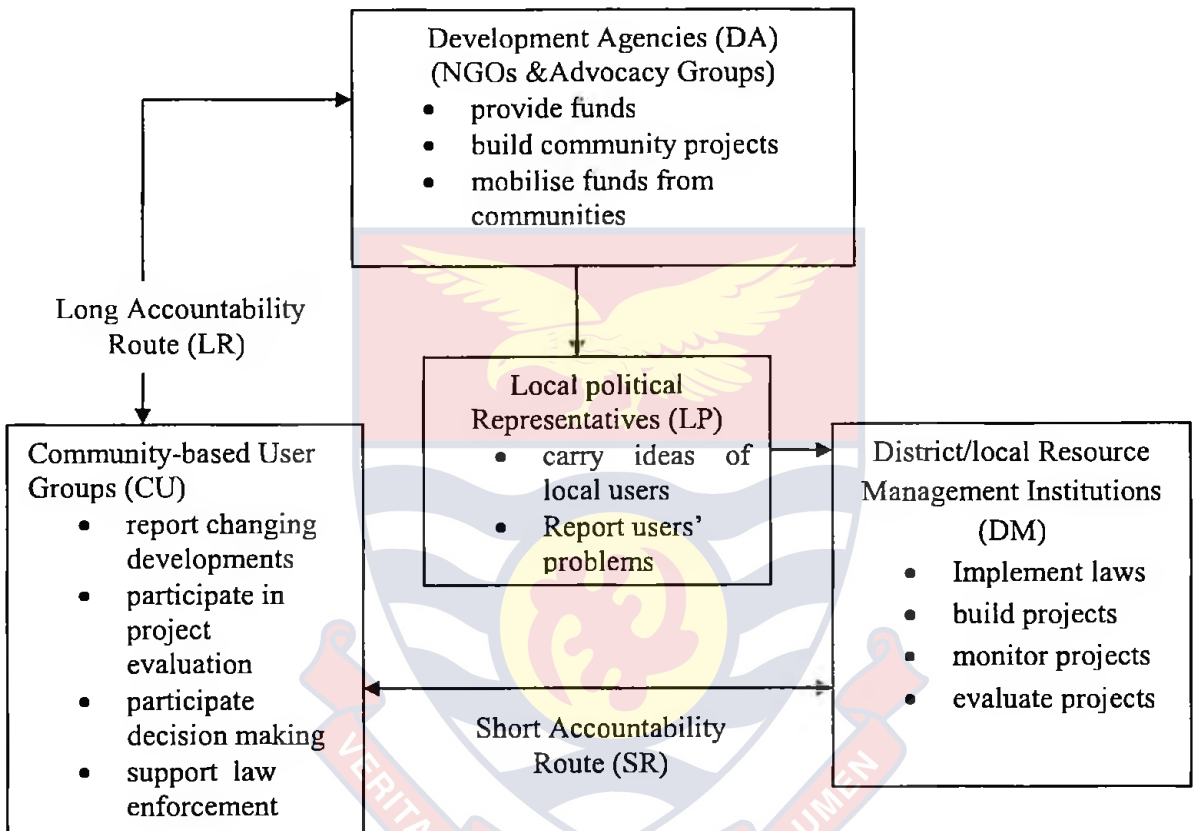


Figure 2: World Bank Accountability Framework
Source: Adapted from the World Bank (2004)

The important features that are relevant to this study are that, it:

- identifies community resource-user-groups (cell CU) as important stakeholders who have the power to demand for accountability;
- segregates responsibilities of national resource management institutions from those of district resource management institutions (cell DM) to help government to easily identify the sources of management problems;

- identifies the role of development or advocacy groups such as non-governmental organisations (NGOs) (cell DA) in management of local resources;
- identifies the possible avenues (cell CU) where local communities may obtain power to demand better services from management institutions; and
- identifies the roles that political parties' representatives at the local (cell LP) and national levels should play in the distribution of resources.

In addition to the features indicated above, the WBA-framework (Figure 2) shows two main routes that local resource users may follow to obtain advice from management institutions. In the framework, users may either take the short accountability route (cell SR), or send their request to political representatives (cell LP) through the long accountability route (cell LR). The World Bank (2004), for example, has advised that if resource-user groups follow the short route to demand fairness or accountability, it (the route) will be able to get them the results that they want. More so, the World Bank realised that the long route to accountability (cell LR) normally creates pervasive clientelistic problems that weakens resource management systems.

In resource management, the term clientelism refers to the tendency of political patrons to provide communities or clients special services in exchange for (political) votes. Clientelism has been identified by the World Bank (2004) as the main cause of improper resource allocation or distribution. For example, it leads to preferential distribution of social amenities such as

drinking water to local communities that belong to particular political parties (Keefer, 2005).

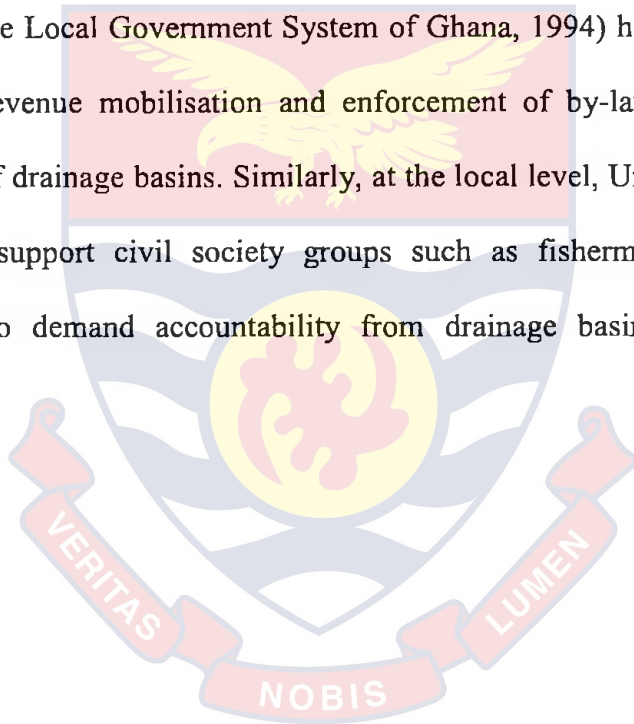
Another weakness of the WBA Framework is that it focuses only on one management principle which is accountability relations between managers of social services and clients. The UNDP and the SHD (1997) have listed participation, responsiveness and transparency as the other important principles that may be used to support institutions to regulate social services. Based on the above discussions, the present researcher has drawn on the strength of the WBA framework to construct a suitable model (Figure 3) that has all the possible communication links, and the important principles which, if followed closely by the institutions in charge of the Ankobra River basin, would bring desirable results.

Integrated Drainage Basin Governance Framework

The Integrated Drainage Basin Governance Framework (Figure 3) is the framework that has been adopted for this study. This framework is built using the relevant parts of the UNDP and SHD's (1997) Principle of Good Governance (PGG) framework, the World Bank's (2004) Accountability framework, and the WRC's (2000) Integrated Water Resource Management framework that have been discussed earlier. The Integrated Drainage Basin Governance Framework (IDBG framework) has been designed to assess the institutional dynamics needed to govern resource use in the Lower Ankobra River Basin. The following discussions give details of the structures or parts of the framework that helps this study to achieve its objectives.

First, the Integrated Drainage Basin Governance Framework (IDBG-framework) has been designed to show a proper administrative route that can

be followed for effective management of the Lower Ankobra River Basin. This is done to enhance analysis of the effects of decentralising the management system built for the Lower Ankobra River Basin. To facilitate the analysis of the effects of decentralisation, the important roles of some local resource management intermediaries such as the Regional Coordinating Council (RCC), the Metropolitan, Municipal and District Assemblies (MMDAs), and the Zonal Councils (ZC) or Unit Committees (UC) were infused into IDBG framework (see cells MLI & LLI). For example, the MMDAs (in the Local Government System of Ghana, 1994) have been given the roles of revenue mobilisation and enforcement of by-laws, to support conservation of drainage basins. Similarly, at the local level, Unit Committees are urged to support civil society groups such as fishermen or farmers associations, to demand accountability from drainage basin management institutions.



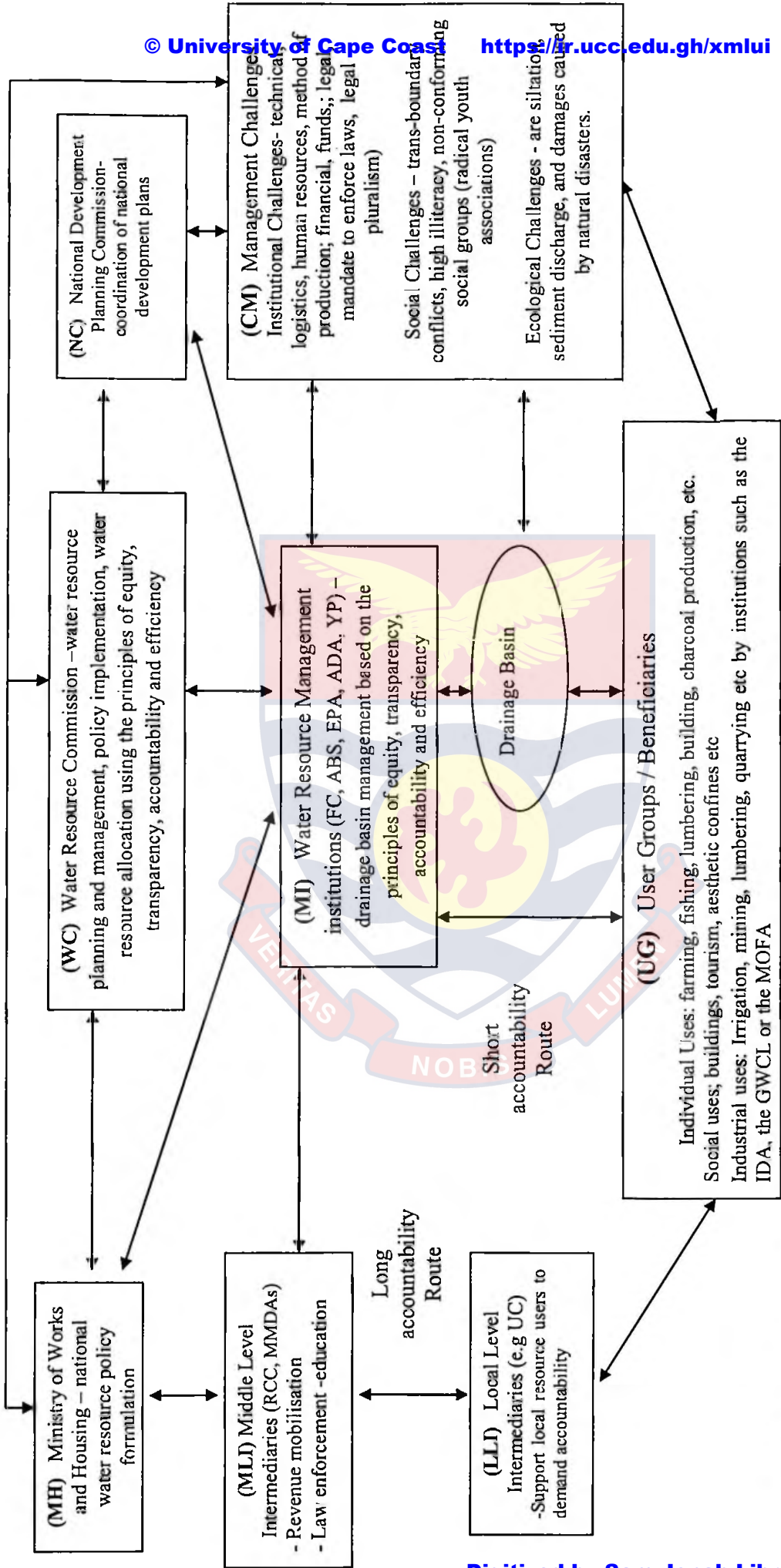


Figure 3: The Integrated Drainage Basin Governance Framework
 Source: Adapted from UNDP (1997), World Bank (2004) and WRC (2000)

Second, in order to properly assess the principle of accountability in the management of the Lower Ankobra River Basin, two routes of accountability, namely; the short route (link UG-PS), and the long route (link UG-LR-NR-MH) have been included in the IDBG framework. The inclusion of these routes was necessary because they (the routes) can serve as common pathways through which local people may follow to demand accountability from social services providers (World Bank, 2004). As such, the UNDP and the Sustainable Human Development (1997) opined that avenues opened to resource users can be used to determine the approach that they may use to demand accountability. Consequently, these two avenues (the short and long routes) have been included for the users of the Lower Ankobra River Basin to select the one that is ideal to demand accountability from management institutions.

The IDBG-framework has also been designed to show some important linkages that should exist between the Water Resource Commission (WRC) and its subordinate institutions which are the NDPC, MWH, FC, EPA, NGOs, the civil society groups, and local authorities. The WRC (cell WC) is expected to make sure that its subordinate institutions cooperate and consult the WRC before undertaking projects. The Ministry of Works and Housing (MWH) (cell MH), and the National Development Planning Commission (NDPC) (cell NC) are expected to coordinate national development plans, and to formulate national drainage basin management policies in support of the efforts by the WRC. Hence, the framework (Figure 3) includes all the possible linkages that should exist among management institutions. The inclusion of the linkages, it

is hope, will help to clarify the functional character of the networks that exist among the institutions that are managing the Lower Ankobra River Basin.

The IDBG framework has two particular cells (cells WR and MI) that indicate the important management principles (that are equity, transparency, accountability and efficiency) that should be followed by national and local management institutions to meet long term goals. The framework goes further to draw attention to an essential linkage (link WC-MI; consultations-supervision link) that should connect national and local management institutions to work in accordance with the five (5) management principles that have been described above.

Finally, the IDBG framework includes some institutional capacity and social challenges (see cell CM in Figure 3) that normally cause project failure. Other ecological challenges have also been outlined in Cell MC, to enable the researcher to assess some damages that may be caused by human and natural factors such as trans-boundary conflict, severe storms, landslides and wildfire on the development of the resources in the Lower Ankobra River Basin.

Summary

The chapter reviewed the relevant empirical studies on drainage basin management that helped the author of this thesis to evolve the most appropriate approach or model for the study on the management of the Lower Ankobra River Basin in the Western Region, Ghana.

In the review, emphasis was placed on the evolution of national policies instituted in the 19th Century, as a result of the problems that several countries faced when they made attempts to draw freshwater and cultivate arable lands in their river basins. To tackle problems such as over-extraction

of drainage basin resources in developing countries, certain approaches emerged. Prominent among them were the top-down, bottom-up, sectoral and integrated approaches. It was observed that most developing countries that adopted the top-down approach were faced with problems of drainage basin management; hence they adopted the bottom-up and sectoral approaches that yielded good results, especially in agriculture. The chapter highlighted the enormous increase in agricultural production of countries in East Africa, Central Asia and Europe that relied on the integrated approach to drainage basin management. The review showed that Ghana relied on the traditional approaches that were based on customary laws and community roles, and which did not ensure conservation. The major problems observed were the multiplicity of functions of institutions when Ghana made the attempt to use the integrated management approach.

The chapter reviewed three different models or frameworks that have been used to manage drainage basins in many geographical settings. The first framework was the Principle of Good Governance (PGG) that dwelt on legitimacy and voice, direction, performance accountability, and fairness in good management of drainage basins. The chapter went further to describe and discuss the features of the WRC's (2000) Integrated Water Resource Management Framework. This WRC's (2000) IWM framework outlined the special roles assigned to water resource management institutions in Ghana. The third framework, the WBA-framework added that accountability is an important principle that ensures openness, and also makes institutions answerable to their actions. Finally, the chapter described the framework of the present author, the IDBM framework which helped to place the

management of the Lower Ankobra River Basin into a proper administrative structure.



CHAPTER FOUR

METHODOLOGY

Introduction

This chapter describes the methodology for the study. It first describes the physical features of the Lower Ankobra River Basin and the justification for choosing the study area. The methodological issues in social science research, the research approach or design, data types and sources, the target population, sample size determination, and procedures are also described. The research instruments, data collection methods, data processing and analysis, and the challenges encountered in the field during the data collection, are presented and discussed. The chapter ends with the presentation of some ethical issues.

Profile of the study area

Location

The study area is the Lower Ankobra River Basin (Figure 5). It is located between latitudes $4^{\circ} 52'N$ and $6^{\circ} 27'N$, and between longitudes $1^{\circ} 42'W$ and $2^{\circ} 33'W$. It is bounded in the east, west and the south by the Pra Basin, Tano Basin and the Gulf of Guinea respectively. The basin has an area of $8,403 \text{ km}^2$. The lower portion which is the study area spans over three political districts that are Wasa Amenfi, Wassa West, and Nzema East. The study area which is referred to as “the Lower Ankobra River Basin” has a total area of 2300 km^2 (Ghana Statistical Service, 2010).



Figure 4: Map of the Ankobra River Basin
 Source: Cartography Unit of the Department of Geography and Regional Planning (DGRP), UCC (2014)

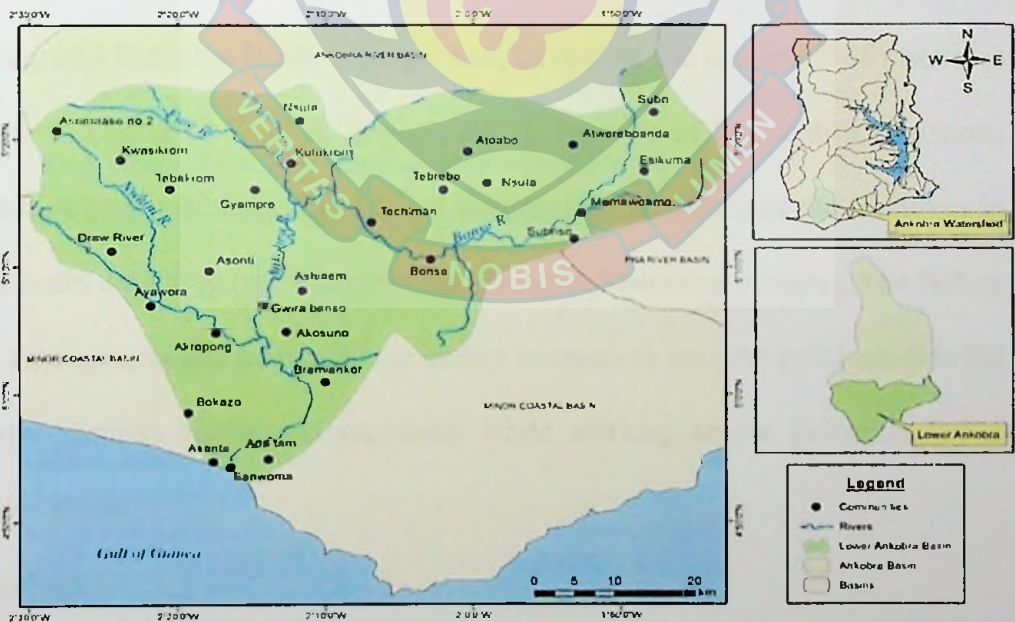


Figure 5: Map of the Lower Ankobra River Basin
 Source: Cartography Unit of the Department of Geography and Regional Planning (DGRP), UCC (2014)

Justification for the choice of study area

The Lower Ankobra River Basin was chosen for the following reasons: First, the basin is endowed with natural resources such as minerals, forest, rivers, and a favourable climate that supports the cultivation of a number of food and cash crops (Wilson & Bryant, 2007). Second, the large amount of resources in the basin has attracted quite a number of people. The population has grown at the rate of 2.3 percent per annum during the past five years (Ghana Statistical Service, 2013; Mireku, 2013; Opong, 2014; WRC, 2000). Unfortunately, about 30 percent of the local people in the basin have limited access to the resources of the basin (Amakye, 2012). Therefore, management of resources in the basin that should create equitable access for all potential users has been an issue of concern.

Successive governments of Ghana have made several attempts by setting out a number of policies such as the National Buffer Zone and the Integrated Drainage Basin Management, to control the extraction of resources from the basin (Wilson & Bryant, 2007). In spite of the control measures, management institutions have failed to conserve and distribute the resources in the basin equitably (see Chapter One, Problem Statement section). The failure of management has motivated the author to research into the problems that the (management) institutions encounter while working in the Lower Ankobra River Basin.

Geology

The Lower Ankobra River Basin has rocks of Birimian and Tarkwaian origin which contain mineral deposits such as gold, manganese, bauxite and diamond (Ghoshal & Nohria, 2014). The Tarkwaian rocks in the basin overlie

the Birimian, and consist of thick sequence of arenaceous and argillaceous sediments (Kesse, 1985). The major soil types are ferric Acrisols and dysric Fluvisols. The ferric Acrisols are fertile, and occupy about 56 percent of the area (Water Resource Commission, 2010; Kortatsi, 2007).

Relief and Drainage

The Lower Ankobra River Basin has an undulating surface. The general elevation is 150–200 meters above sea level. The basin is drained by the Ankobra River and its tributaries that have eroded the highlands to create several isolated hills (Agyemang-Duah, 2010). The Ankobra River and its tributaries have deposited large amounts of sediments in the lower part of the basin, which have increased the fertility of the soils (WRC, 2010).

Climate and Vegetation

A moist tropical type of climate is experienced in the Lower Ankobra River Basin (Jodha, 2002; Wilson & Bryant, 2007). This area has a mean annual rainfall of 1500 mm. The monthly mean temperatures are high throughout the year, ranging between 26–30°C. The area experiences two rainfall seasons yearly. The major rainfall season occurs from May to July, and the minor, from September to October. A short dry season takes place in mid-August, and is followed by a long dry season that lasts from November to February. The mean monthly noon relative humidity varies from 70–80 percent.

The vegetation of the study area is semi-deciduous. There are some economic trees such as mahogany (*Khaya anthotheca*), wawa (*Triplochiton scleroxylon*), Onyina (*Ceiba pentandra*), and Emeri (*Terminalia ivorensis*) that have attracted timber-logging activities into the basin (Mosse, 1997). The

major forest reserves in the basin are the Bonsa Reserve which is 160.58 square kilometres, the Ben West Reserve (26.00 square kilometres) and the Nkontoben Reserve (49.98 square kilometres). All these reserves have been encroached by the timber loggers in the basin (Kortatsi, 2007; Ghoshal & Nohria, 2014).

Research philosophy

This study followed the pragmatist approach while examining the institutional dynamics needed to manage resources in the Lower Ankobra River Basin. The approach of the pragmatists rejects the metaphysical concepts associated with paradigm confrontations, and focuses on practical steps while answering research questions (Tashakkori & Teddlie, 2003, p. 20). A major step to reject metaphysical concepts is to adopt a mixture of approaches that are positivist and interpretivist, which work best in a real world situation (Creswell, 2005; Rossman & Wilson, 1985).

The study combined both quantitative and qualitative approaches (mixed methods) to solicit for complementary responses from the local people living in the Lower Ankobra River Basin. The quantitative method was used to collect, and analyse responses of questions on how respondents use resources in the basin. The qualitative method was employed to gather and analyse responses from key informants such as the heads of Environmental Protection Agency (EPA), Forestry Commission (FC), Water Resource Commission (WRC), and local chiefs.

The major criticism of the mixed method approach is that it is time consuming when analysing digital and quantifiable data. Although it has been criticised, the method guarantees complementarity of views, and therefore

enhances understanding of the phenomenon being studied (Creswell, 2003; Sarantakos, 2005; Bergman, 2008). In fact, Depoy and Gitlin (2005) have observed that the mixed method approach enables realistic and consistent results to be obtained, hence it was employed.

Research design

Research design is the plan, structure, or strategy of investigation (Kumar, 2005). According to Sarantakos (2005), research design helps to introduce systematic approach that enables a researcher to assess all aspects of the study in a logical sequence. Research designs can be categorised into three main types; namely, explanatory, descriptive and exploratory (Stebbins, 2001; Saunders, Lewis, & Thornhill, 2003; Cooper & Schindler, 2006). The explanatory design looks for explanations of the nature of relationships while the exploratory research design is mostly employed in situations where researchers have limited or no scientific information available on activities, processes or groups being investigated (Creswell, 2005; Glynn & Woodside 2009; Punch, 2003; Payne & Payne, 2004). The descriptive research design seeks to provide accurate observations of a phenomenon. In other words, the researcher measures things as they are – no attempt is made to change behaviour or conditions (Creswell, 2005; Osuala, 2001).

The descriptive research design was used in the present study (to incorporate the approaches that were followed) while observing and taking note of the roles of the stakeholders and any factor that accounted for the differences in the benefits obtained by individual users of the basin. The approach also facilitated adequate description of the background characteristics of respondents such as sex, age and occupations. On the whole,

the use of the descriptive research design presented detailed picture of the entire management system, and the changes that had occurred over time.

Target population

The target population comprised all the state management and user institutions, NGOs, District Assemblies, local chiefs and individuals who manage the resources, or are engaged in economic activities such as mining, fishing and farming in the Lower Ankobra Basin. The relevant state (drainage basin) management institutions identified were the Water Resource Commission (WRC), the National Development Planning Commission (NDPC), the Ministry of Works and Housing (MWH), the Ankobra River Basin Secretariat (ABS), the Environmental Protection Agency (EPA), the Forestry Commission (FC), the Mining Commission (MC), the Hydrological Service Department (HSD), the Water Resource Institute (WRI) of Ghana, the Wasa Amenfi District Assembly (ADA), the Wasa West District Assembly (WWDA) and the Nzema East District Assembly (NEDA). The active non-governmental drainage basin management organisations were the Yen Poano (YP) and Friends of the Nations (FON).

The state user institutions were the Irrigation Development Authority (IDA), the Ghana Water Company Limited (GWCL), the Community Water and Sanitation Agency (CWSA), the Mining Commission (MC), the Ministry of Food and Agriculture (MoFA), and the Hydrological Service Department (HSD), while the private user institutions were the AngloGold Mining Company (AMC), the Bona Oil-Palm Company (BOC), the Bona Rubber Industry (BRI), and the Sankofa Gold Company (SGC).

The individual users comprised residents from thirteen communities that were Ayawora, Subriso, Subri, Akosuno, Apatam, Bramiankor, Techiman, Bonsa, Nsuta, Gyampre, Kwasiakrom, Ashiem and Tebrebe in the Lower Ankobra Basin. The individual respondents were residents who were engaged in economic activities such as mining, fishing, farming, and sand wining in the basin.

Sample size determination

According to Sarantakos (2005), a sample size is the number of persons or objects that are selected from a population. The present study used 26 key informants made up of eight local chiefs, 10 drainage basin management institutions (WRC, NDPC, MWH, EPA, FC, YP, ABS, ADA, WWDA, NEDA), and eight drainage basin user institutions (IDA, GWCL, MOFA, CWSA, AMC, BOC, BRI, and SGC) (Table 5). In addition to the 26 key informants, the study used Raosoft's (2004) Sample Size Determination Table (Appendix H) to select a sample of 242 respondents from a total of 650 individual users whose economic activities depended on the resources of the basin. The sample frame 650 individual users made up of 209 farmers, 176 fisher-folks, 150 miners, and 115 sand winners, was obtained from the records of the Wasa West District Assembly.

Table 5: Category of respondents used for the study

Sample units	Sample size
<i>Key informants</i>	
Local chiefs	8
Management institutions	10
User institutions	8
Total number of key informants	26
<i>Individual users</i>	
Farmers	78
Fisher folks	66
Mineral miners	55
Sand miners	43
Total number of individual Users	242

Source: Field data (2016)

Sampling procedure

Pallant (2005) and Bryman (2004) have stated that because there is rarely enough time or money to gather information from everyone or on everything in the population, there is the need for social science researchers to take steps to select units that shall represent the population under study. For this particular study, the following were the steps taken to select respondents:

With regard to the qualitative aspect of the study, the non-probability sampling technique used was purposive. The purposive sampling technique was used because it was useful for locating the respondents (the local chiefs, the heads of management and user institutions) who became the key informants, who provided useful information for the study. The choice of the number of management and user institutions was in line with the advice of Silverman (2000) who recommended small sample sizes for qualitative studies because it enhances the collection of in-depth information.

The purposive sampling technique was used to select eight chiefs (one from each of the following settlements Ayawora, Subriso, Akosuno, Apatam, Bramiankor, Bonsa, Nsuta and Gyampre) out of thirteen settlements that are Ayawora, Subriso, Subri, Akosuno, Apatam, Bramiankor, Techiman, Bonsa, Nsuta, Gyampre, Kwasiakrom, Ashiem and Tebrebe in the basin. The selection of the eight local chiefs was relevant because they provided information about the attitude and behaviour of the indigenous people towards the management of the natural resources in the basin. The choice of the purposive sampling method falls in line with the discoveries of Silverman (2000) who advised that qualitative approach should employ techniques that enhance flexibility.

The purposive sampling technique was also used to select 10 drainage basin management institutions (WRC, NDPC, MWH, EPA, FC, ABS, YP, ADA, WWDA and NEDA) from a total of 14 that were the Environmental Protection Agency (EPA), the Forestry Commission (FC), the Mining Commission (MC), the Ministry of Works and Housing (MWH), the National Development Planning Commission (NDPC), the Ankobra River Basin Secretariat (ABS), Yen Poano (YP), Friends of the Nations (FON), the Hydrological Service Department (HSD), the Water Resource Commission (WRC), the Water Resource Institute (WRI), the Wasa Amenfi District Assembly (ADA), the Wasa West District Assembly (WWDA), and the Nzema East District Assembly (NEDA). The 10 selected management institutions were active, and each performed different duties in the management of the drainage basin. The three District Assemblies (Wasa Amenfi, Wasa West and Nzema East) in the basin were added to the management institutions because the *Local Government Act, Act 462 of 1993*, gave the District Assemblies the responsibility to support the development of social projects.

Eight drainage basin user institutions (IDA, GWCL, MoFA CWSA, AMC, BOC, BRI, and SGC) were also selected purposively from a total of 10 user institutions that were the Irrigation Development Authority (IDA), the Ghana Water Company Limited (GWCL), the Community Water and Sanitation Agency (CWSA), the Mining Commission (MC), the Ministry of Food and Agriculture (MoFA), Hydrological Service Department (HSD), AngloGold Mining Company (AMC), Bona Oil-Palm Company (BOC), Bona Rubber Industry (BRI), and the Sankofa Gold Company (SGC). Two

institutions – the MC and the HSD, were not selected because they were not operating.

With regards to the quantitative aspect of the study, the multi-stage sampling technique was used to select 242 individual drainage basin users from a total of 650 people made up of 209 farmers, 176 fisher-folks, 150 miners, and 115 sand winners (Table 6). The various stages involved in this sampling technique are explained as follows:

At the first stage of the sampling, proportional allocations were done to distribute the 242 respondents among four groups comprising farmers, fisher-folks, mineral miners, and sand miners in the basin. The proportional allocations were 78 (32.1%) farmers, 66 (27.1%) fisher-folks, 55 (23.1%) miners, and 43 (17.7%) sand winners (Table 6).

Table 6: Sample size calculation

List of main clusters	Total population in each cluster (A)	Proportion for each cluster (B) = $[A/Total \times 100]$ (%)	Sample size for each cluster (C) = $(B/100 \times \text{sample size})$	Sample size for each community = (No. in community/Total cluster Population $\times C$)
Farmers	209	32.1	78	Ayawora (22), Subriso (16), Subri (24), Akosuno (16)
Fisher folks	176	27.1	66	Apa tam (29), Ayawora (17), Bramiankor (20)
Mineral miners	150	23.1	55	Techiman (11), Bonsa (14), Nsuta (30)
Sand miners	115	17.1	43	Gyampre (8), Kwas-ikrom (6), Ashiem (7), Tebrebe (22)
	650		100	242

Source: Author's Compilation (2016)

At the second stage, the respondents allocated to each cluster were distributed proportionately among the various occupational groups that were in the study communities. For example to obtain the number of farmers required, 22 farmers out of 59 in Ayawora, 16 farmers out of 44 in Subriso, 24 farmers out of 42 in Subri, and 16 farmers out of 42 in Akosuno, were selected randomly. Using random selection technique, a sample frame was created (by numbering the individual users), and the lottery method was used to pick them. The selection brought the total number of farmers to 78. This process was followed to obtain 66 fisher folks, 55 miners and 43 sand winners from the selected towns in the basin (Table 6).

Eventually, 78 farmers, 66 fisher-folks, 55 mineral miners, and 43 sand winners were selected from the various occupational groups in the selected towns, to give the 242 respondents needed for the quantitative analysis. The responses obtained from the 242 individuals justified the results of the statistical analysis. The number (242) supported the observation of Hair, Anderson, Tatham and Black (2012) who said that though there is lack of consensus on the maximum sample required, a minimum sample size of 100 out of 140, or 150 out of 245 is valid for statistical analysis.

Data and sources

Both primary and secondary data were employed. The primary data were collected from the management and user institutions, and from the individual resource users (78 farmers, 66 fisher folks, 55 mineral miners and 43 sand miners) in the drainage basin. The primary data consisted of the socio-demographic characteristics of respondents, management approaches and principles, institutional linkages, and community involvement in the

management of the drainage basin (see Appendices A, B, C, D and E). Information on the problems faced by the institution, and the effects of drainage basin management on the economic activities of users were all primary data.

The secondary data consisted of information taken from books, journals, newspapers, articles and reports on drainage basin management and development. The secondary data were comprised of information on the approaches such as the top-down, the bottom-up, and the sectoral, and of models such as the WRC's (2000) Integrated Water Resource Management Framework.

Steps to ensure validity, reliability and trustworthiness of findings

The relevance of validity, reliability and trustworthiness in scientific researches cannot be overlooked (Joppe, 2000). Reliability, according to Shenton (2004), measures the extent to which the results of a study are consistent over time. Validity determines whether a research instrument truly measures that which it is intended to measure to authenticate findings" (Joppe). Trustworthiness in scientific research seeks to ask the question: "How can an inquirer persuade his or her audience that the research findings of an inquiry are worth paying attention to?" (Lincoln & Guba, 1985). Validity, reliability and trustworthiness were ensured as follows:

Validity was ensured through the application of triangulation techniques which allowed the use of different research instruments at different times. It is worth noting that, in this study in-depth interview guides, semi-structure interview guides, and observation checklists were used to collect data on same issues from all the categories of respondents – the local chiefs and

heads of management and user institutions. These instruments were structured to elicit similar responses from heads of management and user institutions and from the local chiefs at different times to validate the data for analysis.

The researcher obtained reliable data by conducting interviews periodically; several discussions were done with respondents whenever there was opportunity. For example, heads of management were interviewed frequently at the beginning of every month when they were less busy. These procedures were followed to ensure reliability of the research findings.

To ensure trustworthiness, the researcher allowed respondents to read over the answers they provided to check whether they (the responses given) matched their intentions. Trustworthiness ensures accuracy and adequacy of responses and also enhances reliability and validity (Lincoln & Guba, 1985). The local chiefs, heads of management and user institutions were given the opportunity to verify their responses in most cases. In a few cases, the responses from illiterate users and illiterate chiefs were read out to them, to allow verifications or corrections.

Data collection instruments

Considerations for development of the data collection instruments

Prior to designing the instruments, a thorough literature search was conducted to determine and categorise concepts and variables that had been used in similar studies. Afterwards, three sets of in-depth interview guides (IDIs), a semi-structured interview schedule, and an observation checklist were developed to collect the relevant primary data. The instruments were structured in such a way that they could solicit similar responses from different groups of respondents to ensure triangulation of ideas. The idea of

triangulation as used in the study stems from the belief that the validity of research findings and the degree of confidence in them are enhanced by the deployment of more than one instrument or approach to data collection (Bryman, 2004; Patton, 2002).

The following sections describe how the instruments – in-depth interview guides (IDIs), semi-structured interview schedule and observation checklist – were used in the data collection in the field.

In-depth Interview (IDI) Guides

A key requirement for using In-depth Interview (IDI) Guides, is that, questions posed to informants during interview sessions must address critical issues, and must also provide in-depth information about phenomena in order to meet a particular research objective (Glynn & Woodside, 2009). With that in mind, 26 key informants who had adequate knowledge about the management system of the basin were identified, and the In-depth Interview guides were served on them. Three (3) sets of the guides (see Appendix A, B and C) were developed to collect data from the selected chiefs, the management institutions, and from the user institutions, respectively.

The first in-depth interview guide (see Appendix A) served on the chiefs elicited responses regarding the legal mandate of chiefs and local people to support management duties, linkages between local communities and management institutions and the challenges that individual users faced when they tried to support management institutions. The second and third in-depth interview guides (see Appendices B and C) elicited responses on the approach(es), on management principles such as equity or accountability, and on functional levels of collaborations, on consultations or cooperation that

existed among the institutions when they attempted to formulate policies, design and implement projects for conserving resources in the basin.

Semi-structured interview schedule

The semi-structured interview schedule (see Appendix D) was administered to the individual users from the selected communities. The first section of the schedule contained a series of questions that elicited responses on issues regarding the socio-demographic characteristics (such as age, sex, occupation), and the level of education of each user (Table 7). The second section covered matters relating to the use of management principles, and levels of coordination that users expected from the institutions in charge of managing the basin. The third section was used to identify the attempts made by the institutions to involve the local users in management activities. Finally, the effects of management approach on economic activities, and difficulties encountered by management institutions formed the themes for the last section of the interview guide (Table 7).

The semi-structured interview schedule (see Appendix D) was used because during the pre-testing stage, it helped to build good rapport, and also created a relaxed and healthy atmosphere between the present researcher and the respondents. It enabled individual users (miners, fisher folks, sand winners and farmers) to voice out any grievances due to the questions posed to them. Finally, it helped respondents to co-operate and answer questions satisfactorily.

Table 7: Summary of sampling techniques and data collection methods

Category of Respondent or Sample unit	Information sought or Item observed	Sampling Technique	Research instrument & Data collection method.
Eight out of thirteen community chiefs	<ul style="list-style-type: none"> - Drainage basins management approach - Legal mandate of these chiefs -Ways of community involvement -Linkage between these chiefs and other user institutions or organisations -The role that chiefs play to support management -Challenges of chiefs as stakeholders involved in the management of drainage basins 	Purposive	In-depth Interview Guides / In-depth Interviewing
Ten (EPA, FC, WRC, YP, MWH, ABS,ADA, NDPC WWDA, NEDA) out of fourteen drainage basin management institutions	<ul style="list-style-type: none"> -Drainage basins management approach adopted or adapted -The role (s) that these management institutions play to manage the drainage basins. -Linkage between management institutions, individual users, user organisations and chiefs. -Legal mandate of management institutions -Challenges and the capacity of management institutions or organisations. 	Purposive	In-depth Interview Guides / In-depth Interviewing
eight (IDA, GWCL, MOFA , CWSA AMC, BOC, BRI, and SGC) out of ten user institutions	<ul style="list-style-type: none"> -Economic activity undertaken on the Ankobra Drainage basin -Effects of the activities of user institutions on management activities and ways to address their effects 	Purposive	In-depth Interview Guides / In-depth Interviewing
78 out of 209 farmers, 66 out of 176 fishermen, 55 out of 150 mineral miners and 43 out of 115 sand miners	<ul style="list-style-type: none"> Effects of drainage basin management on economic livelihood activities Contributions (financial, technical and legal support) of these groups to govern the lower Ankobra Drainage Basin management 	Multi stage	Semi-structured Interview guides
The Lower Ankobra River Basin	<ul style="list-style-type: none"> Presence of trees, erosion control structures, medical or educational facilities or negative developments in the basin 	Purposive sampling	Observation checklist

Source: Author’s Compilation (2016)

Observation checklist

The study made use of non-participant observation to follow the advice given by Sarantakos (2005). To generate true or genuine results while interviewing, Sarantakos advises researchers to avoid participating in the activities of respondents.

Some portions of the Lower Ankobra River Basin were undergoing degradation and to estimate the areas degraded, the observation checklist (see Appendix, E) was used. The checklist was also used to assess the positive or negative developments that had affected the benefits which the local people were deriving from the basin.

The checklist helped to identify projects such as trees planted and structures that had been put in place to control erosion along the banks of the major rivers in the basin. The checklist was also used to identify projects that were geared towards infrastructural development such as sinking of boreholes, construction of roads, and health facilities provided to attract participation of the local users in the management. To find out whether there were any negative developments such as erosion or flooding and depletion of resources in the basin, 'Yes' or 'No' columns were included (in the checklist) to help in the identification [of the portions of the basin that have been depleted (Yes), not depleted (No)].

Pre-testing of instrument

A pre-test is a small test of single elements of a research instrument that is predominantly used to check the efficiency of a questionnaire or an instrument (Miles & Huberman, 1994; Sarantakos, 2005). Babbie (2007) postulated that pre-testing is undertaken to address five critical issues: the

researcher's understanding of the behavior of actors to be studied; motivation levels of parties involved in a study; roles to be played by interviewers and interviewees; and the determination of the soundness of data collection and analytical methods to be employed. In view of the five factors, a pre-testing of the instruments for the study before the actual data collection was deemed necessary.

Pre-testing was conducted on heads of a few selected management and user institutions, local chiefs and individual users of the basin between 12th May and 9th November, 2014. This exercise was useful because it gave the researcher the opportunity to delete and modify some variables from the questionnaire which would have otherwise affected the validity of the data collection. For example, variables such as land cover changes and regulatory services to be derived from the basin were impossible to measure considering the time available for the study. Any attempt to measure these variables would have delayed the data collection exercise.

Finally, the pre-test helped the researcher to identify some sensitive questions that would have invaded the privacy of individual users (such as gold miners), and to discourage them from participating in the study. All such questions were, after the pre-test, removed from the instruments before the actual field-work.

Ethical considerations

The ethical dimension of every research and how they are addressed are imperative to talk about. In view of this, the present researcher adhered to all ethical rules by making sure that key issues of ethics in research were

strictly observed. These included informed consent, anonymity, confidentiality and privacy that have been discussed as follows:

Informed consent

As observed by Leary (2001), protecting the rights of participants is important in every research. Informed consent is simply informing research participants of the nature of the study, and obtaining their explicit agreement to participate (Leary). As such, adequate information about the study was given to all the participants.

The study sought verbal information from the user groups such as farmers, miners and other household users of the basin. With respect to the heads of local institutions and the chiefs, an informed consent document endorsed by the Institutional Review Board (IRB) of the University of Cape Coast, was submitted for permission before data collection started. That was done to ensure that participants were not coerced in anyway.

Anonymity

Anonymity is ensured when the name of a respondent does not appear on the research instrument or data (Sarantakos, 2005). According to Babbie (2007) anonymity must be observed to make identification of objects or individuals impossible. Consequently, the use of the semi-structured interview schedules, for example, did not bear the names of participants, thereby making traceability difficult. While analysing the information obtained by the IDIs, the names of local chiefs, the heads of user and management institutions, were taken out, and pseudonyms given.

Confidentiality

The purpose of confidentiality is to conceal the identity of participants (Babbie, 2007; Fanning, 1999; Jackson & MacCrimmon, 1999; Sarantakos, 2005). Confidentiality was ensured in order to protect the rights of all participants. The researcher did not divulge any information given by respondents to anyone.

Privacy

“Privacy is observed when respondents are given the opportunity to decide when and where, or to what extent his or her attitudes, beliefs, and behaviour will be revealed to other people who are not part of the research” (Singleton, Straits, Straits, & McAllister 1988). The present researcher observed this ethical principle by ensuring that a participant’s private life was not questioned. That is, sensitive questions that could make the respondents uncomfortable were avoided. The essence of privacy was to give respondents a relaxed and comfortable environment to answer questions that were related to the use of the resources of the basin (Singleton et al.).

Data collection/field work

In the process of collecting information from respondents, it is important to follow the standard procedures of research (Economic and Social Research Council, 2002). In line with this ethical standard, rights of entry into the communities, and assurance of the heads of the selected institutions were obtained, after letters of introduction from the Department of Geography and Regional Planning of the University of Cape Coast were sent out. With regards to the chiefs of the selected settlements, letters of introduction were accompanied by drinks. This step taken is one cherished by Ghanaians,

specifically in the 'Fante' cultural setting, where it is customary to provide drinks when paying courtesy call on a local chief.

Three research assistants were engaged to support the data collection exercise which was undertaken from 1st January to the 19th of June, 2015. Heads of institutions who agreed to partake in the study were pleaded with to mobilise their subordinates for interviewing. Whenever the principal researcher encountered difficulties in getting adequate responses from the heads of management and user institutions, the field assistants were called to continue with the interviews. In some other cases, the institutional heads were given ample time, to allow successful completion of the in-depth interviews, so as to make the data collected representative, reliable and adequate for analysis and drawing of meaningful conclusions.

Individual users of the basin were approached in their respective fields of work, and permission was obtained from their leaders before interviews were conducted. As a matter of worry, some individual users, based on their bad personal experiences, refused to allow the interviews to be conducted while they were working. For this reason, several interviews were conducted until all the necessary information was obtained in June, 2015 when the field work finally ended.

Challenges encountered in the field

During the data collection, a number of difficulties were encountered from all the categories of respondents. For example, there was difficulty in meeting some of the users, particularly the gold miners and the sand winners, for permission to conduct interviews. For example, most of the gold miners ran away while others were unwilling to give good responses to questions

asked. The researcher and his field assistants had to follow them to their homes for the interviews. Some of the users gave false addresses while others such as the heads of the management and user institutions failed to meet field assistants at the appointed time for interviews. Again, most of the individual users were not willing to co-operate because they were of the view that the study had no impact on their economic activities.

To overcome these challenges, the researcher tactfully and persistently persuaded those respondents, and rescheduled another meeting with them. These challenges increased the cost of data collection; however, they did not affect the data collection exercise and therefore had no effect on the findings of the study.

Data processing and analysis

According to Sarantakos (2005), the data analysis allows the researcher to organise data collected in order to assess and evaluate the relevant findings to arrive at reasonable conclusion. Before analysis was done, data preparation was done to ensure accuracy and completeness. During the data preparation, interview responses obtained from the heads of the drainage basin management and user institutions using the IDI guides, were first coded, transcribed manually, and arranged into specific themes. The themes were arranged according to the study objectives, assessment of the capacity of the management institutions, functional networks, principles, and the approach(es) that were followed by management institutions to distribute the resources of the basin.

The completed semi-structured interview schedules collected from the individual users were inspected, and the information that was irrelevant to the

study was eliminated. The remaining responses were coded and templates were laid. The data were inputted into the Statistical Product for Service Solution (SPSS, version 16 software) for processing by the researcher. The quantitative data was analysed based on a default alpha level of 5 percent (0.05) with a confidence interval of 95 percent. All statistical decisions were made based on this alpha level. The analysis of the quantitative data was based on the third objective of the study that evaluates the approaches and principles for sharing the basin's resources. The data was mainly analysed using tables to show the frequency and percentage distributions of the relevant variables.

The independent-samples t-test was employed to compare the differences in the mean perceptions held by males or females about the productive, religious and educational values of the basin's resources. To examine the perceptions of the users about the benefits of the basin according age groups (*Group One: <20; Group Two: 20-24; Group Three: 25-29; and Group Four 30+*), a one-way analysis of variance (ANOVA) was employed. Finally, post-hoc comparisons using the Tukey's Honestly Significant Different (HSD) test was employed to compare the perceptions of individuals from the various occupational groups about the values (benefits) of the basin's resources. Table 8 summarises the details of all the methodological procedures involved in the study. The relevance of this table is to give a quick reading of the research objectives, types of data, key variables, measurement scales, data sources, target population, data collection and the analytical methods used in the study.

Table 8: Summary of objectives, types of data, key variables, measurement scale, data sources, target population, data collection and analytical methods used

Specific objective	Types of data	Key variables	Measurement scale	Data Sources	Target Population	Instrument/Methods of data collection	Analytical methods
1. Assess the capacity of each of the institutions responsible for managing the Lower Ankobra River Basin	Qualitative	State of legal capacity State of financial capacity	Nominal Ordinal & Interval	Primary	Management institutions: WRC,NDPC, MWH, EPA, FC, NGOs, DCEs, community chiefs,	In-depth interview Guides/ in-depth interviewing	Thematic & content analysis of data
2. Examine the functionality of the networks that exist among the institutions responsible for managing the Lower Ankobra River Basin	Quantitative	State of technical capacity Level of collaboration, Level of co-operation,	Nominal, Ordinal & Interval Ordinal	Primary	Management institutions: WRC,NDPC, MWH, EPA, FC, NGOs, DCEs, community chiefs,	In-depth interview Guides/ in-depth interviewing	Frequencies & means
	Quantitative	Level of co-operation, level of consultations; among top/local institutions	Ordinal	Primary	Management institutions: WRC,NDPC, MWH, EPA, FC, NGOs, DCEs, community chiefs,	In-depth interview Guides/ in-depth interviewing	Frequencies , means & percentages

Table 8: *continued*

Specific objective	Types of data	Key variables	Measurement scale	Data sources	Target Population	Instrument/Methods of data collection	Analytical tools
3. Evaluate the management systems for sharing the resources in the Lower Ankobra River Basin	Management approaches	Approach to: policy formulation and implementation; Project design and building; Monitor and evaluate projects	Nominal Nominal Nominal	Primary Primary Primary	Management institutions: WFC, NDPC, MWH, EPA, FC, NGOs, MMDAs, Community chiefs,	Semi- Structured interview Guides/ interviewing Checklist Observation	Frequencies, percentages,
	Management principles	Transparency Accountability Efficiency Equity	Ordinal, interval & nominal	Primary	Individual users (miners, farmers & fisher folks)	Semi- Structured interview Guides/ interviewing	Independent-samples t-test and Tukey's Honesty Significant Different (HSD) test

National Development Planning Commission (NDPC), Water Resources Commission (WRC), Ministry of Work and Housing (MWH), Environmental Protection Agency (EPA), Forestry Commission (FC), Non-Governmental Organisations (NGOs), Metropolitan and Municipal District Assemblies (MMDAs)

Source: Author's Compilation (2015)

CAPACITY OF THE LOWER ANKOBRA RIVER BASIN MANAGEMENT INSTITUTIONS

Introduction

This chapter presents the capacity of each of the institutions responsible for the management of Lower Ankobra River Basin. In doing so, the chapter first describes the responsibilities, or the mandates given to the institutions to work. It further outlines the technical, financial and legal capacities of both state and private management institutions involved in the basin management, by bringing out the challenges facing them as they try to prevent or reduce the depletion of the forest resources in the basin.

Responsibilities of the Lower Ankobra River Basin Management Institutions

The major task given to the Water Resource Commission (of Ghana) after it was established in 1996 was to properly plan the use of the resources in all drainage basins in Ghana. Consequently, it became the responsibility of the Commission to manage the Lower Ankobra River Basin. To effectively execute its duties, the WRC was empowered by *the Act of Parliament, Act 522 of 1996* to assign two important duties, each to the National Development Planning Commission (NDPC), and to the Ministry of Works and Housing (MWH). The National Development Planning Commission (NDPC) and the Ministry of Works and Housing (MWH) were specifically mandated to coordinate national development plans, and formulate policies as directed by government (Odame-Ababio, 2010).

in the Lower Ankobra River Basin, the WRC was given the responsibility of soliciting funds from the Ministry of Finance (MoF) (of Ghana), to be distributed to its subordinate agencies such as the FC, EPA and other local management institutions. That duty assigned to the Commission was supported by *Section 12 of the Water Resource Management Act 522 of 1996* that stipulates that:

The WRC shall be responsible for approving and forwarding the budgets of the various local water resource management institutions to the Ministry of Finance. The WRC shall be responsible for supporting its collaborative management institutions with funds to work effectively.

According to the above mandate, the WRC was given strong legal backing to appropriately discharge its financial responsibilities to support local-level agencies in charge of managing the Lower Ankobra River Basin. To further strengthen the legal capacity of the institutions that were assigned duties to manage the resources in the basin, government enacted more laws and regulations. The first was the *Supreme Military Council Decree (SMCD) 85 of 1977* that was enacted to support the Irrigation Development Authority (IDA) to develop and manage irrigation to increase agricultural production in the basin. The *National Liberation Council Decree (NLCD) 293* too was enacted in 1969, to empower the Environmental Protection Agency to monitor and report on projects that threatened to contaminate resources in the basin. The Ghana Water and Sewage Corporation (GWSC), now Ghana Water Company Limited (GWCL) was empowered by the *National Liberation Council Decree*

Commission was tasked to intensify conservatory measures against the depletion of rare plant species in the basin.

From the above, it can be said that government built a strong legal framework (when it formulated several policies) to support the work of the management institutions in the basin. The step taken by government, according to the heads of the local management institutions, increased the legal mandate given to them to operate. The big question often asked is: do the management institutions have adequate capacity in terms of logistics and human resources, to implement those policies formulated by government? To get answers to this question, an assessment of the capacity of the institutions in charge of the management of the resources in the basin, became necessary.

Capacities of the institutions managing the Lower Ankobra River Basin

This section outlines the capacities of all the institutions mandated to manage the resources of the Lower Ankobra River Basin. The approach to accomplish this is organised into two sections. Using qualitative data, the first section assessed the technical and financial capacities of the top management institutions (the WRC, MWH and the NDPC), while the second section dealt more with the capacity of local management institutions in the district.

Financial and technical capacities of the National or Top Management institutions – the WRC, the MWH and the NDPC

Assessment of financial capacity

The establishment of the WRC by government of Ghana in 1996 was followed up by that of the Water Management Fund (WMF) to support financing of activities related to drainage basin management (Odame-Ababio,

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2010). By that, the WRC was given the responsibility to access funds from the Water Management Fund (WMF), and to disburse it appropriately to the supporting management institutions (i.e. MWH and the NDPC).

Results from the in-depth interviews with heads of the MWH and NDPC, indicated that the WRC faced difficulties when it attempted to financially support its subordinate management institutions (the MWH and the NDPC). The key factors that caused the problems and the failure of the WRC to work efficiently were shared by two heads of the top management institutions in the following submissions:

- a. *At the moment we are even tired of asking for funds from the WRC. For almost, eight quarters, we have not received anything from the WMF. I have sent several letters to the WRC to state the urgent needs of the institutions, but I have not had any positive feedback (head of the MWH).*
- b. *Our department has constantly been refused funds for our day-to-day operations. Upon further enquiry, we were told that the Ministry of Water Resources, Works and Housing (MWRWH), our mother institution, had not been financed by the Ministry of Finance! I simply do not understand why the Ministry of Finance has turned a deaf ear to our plight. The reports on the financial challenges from almost all the water management institutions in the country are becoming too many. Now our financial problems are getting out of hand. I think that government sees our work as “being less*

us (head of WRC).

To control the rampant uses of resources in the Lower Ankobra River Basin, it required adequate supply of funds which, unfortunately, was not forthcoming from government. From further discussions, the heads of the top management institutions hinted that they generated their own funds internally, in order to prevent the management set-up from collapsing. The approach taken by the management heads follows the advice by Berelson (2003) and Bergen and Walker (2007) who observed failure in management systems that lacked adequate resources. The authors caution government of Ghana to provide alternative or reliable sources of funds, apart from the Water Management Fund (WMF), to prevent the collapse of the system for managing resources of the basin. Unfortunately, reports from the heads of top management institutions indicated that the government consistently failed to live up to that responsibility.

Assessment of technical capacity

Boedeltje and Cornips (2012) have observed that adequate human resource is an important ingredient in any management system established to promote efficiency. In view of this, in-depth interviews were conducted with the heads of the top management institutions to determine the quality and quantity of human resources that they had for implementing policies and plans. The outcome of the interviews indicated that the top management institutions (the WRC, MWH and the NDPC) were better resourced in terms of personnel. In most cases, answers given by the heads showed slight departure from the actual staff strength recruited, and the required number

Table 9: Human Resource Capacity of the WRC, NDPC and the MWH

Personnel	Institution	Quantity Available	Quantity Expected	Remarks
1. Finance and administrative managers	WRC	3	3	adequate
	NDPC	3	3	adequate
	MWH	3	3	adequate
2. Legal Officers (Lawyers)	WRC	1	1	adequate
	NDPC	1	1	adequate
	MWH	1	1	adequate
3. Environment impact assessors	WRC	2	2	adequate
	NDPC	2	2	adequate
	MWH	1	2	inadequate
4. Information Technology specialists	WRC	2	2	adequate
	NDPC	2	2	adequate
	MWH	2	2	adequate
5. Public relation officers	WRC	3	4	inadequate
	NDPC	2	2	adequate
	MWH	1	1	adequate
6. Mechanical engineers	WRC	3	3	adequate
	NDPC	3	3	adequate
	MWH	2	2	adequate
TOTAL		37	41	Adequate

Water Resource Commission (WRC), Ministry of Works and Housing (MWH), National Development Planning Commission (NDPC)

Source: Field data (2016)

Sam (2010) argues that efficiency is required at all levels of management systems. Sam's statement is underpinned by Mireku's (2014) conceptual framework (the Integrated Drainage Basin Governance Framework) which highlights efficiency as the most important factor that guides the achievement of goals of management institutions. In this regard, it became necessary to find out if the rest of the management institutions were efficient; to help the local users of the basin to generate maximum output. To do that, there was the need to determine whether the local management

institutions had adequate capacities to work efficiently to support the successful operations of the top institutions.

Capacity of local institutions managing the Lower Ankobra River Basin

Financial capacity of the local management institutions

In any principal-agent relationship, the agent and the principal come to agreement on how much payment or resources should be available for a task to be completed (Jensen & Meckling, 2006; Eisenhardt, 2009). While assessing the financial support given to the local management institutions, it came to light that the WRC had given discriminatory directives to the local management institutions to obtain financial help from other sources instead of relying on the Water Management Fund (WMF) that was established by government.

Upon further interrogations, the heads of the local management institutions reported that the directives given to them were too many. Thus, it appears the local management institutions were overloaded with directives which were helpful to get financial assistance. However, the heads became a bit confused, and acted contrary to the instructions given by their superior (the WRC), a situation described by Milgrom and Roberts (2004) as a moral hazard. The problems of moral hazard slowed down the progress of work in the local management institutions. This confirms the findings of Ricketts (2002) and Mensah (2008) about the danger of not solving moral hazards on time.

The most pressing worries of the heads of the local management institutions concerning their poor performance were shared by the manager of the Ankobra River Basin Secretariat (ABS), who submitted that:

I do not know how the WRC expects us to manage this basin.

Would you believe that our institution gets just GH¢ 2,000, in a whole year for all our operations? The state institutions are not any better when it comes to funds for operation. We are rather given new instructions to generate funds from many sources such as the banks, NGOs, development agencies, district assemblies among others. We do not get any financial support when we follow the advice from our superior (the WRC). Lack of funds has, over the years, made us ineffective; and this is why our output levels are low.

In the opinion of Clark and Sharf (2007), and Colish (2009), problems may arise when a principal fails to provide adequate resources for an agent to work. In such a situation, Cantor and Courant (2012) advise the principal (the resource provider) to withdraw or cancel the contract to avoid future problems that may adversely affect the execution of the project. Unfortunately, it was reported by the heads of the local institutions that the WRC never made any attempt to withdraw the contract that it gave to the local institutions concerned with the basin's management. At this stage of the management process, it became easier to predict that the local management institutions would shirk off their responsibilities given to them by the WRC, since they did not have much resource to work with. Similar observations were made by Milgrom and Roberts (2004) about the principal-agent contract between the Shenzhen Energy Company (SEC) of China and the Coal Supply Company (CSC) of South Africa that got broken because of misinformation and poor financing. In

view of this, it became necessary to investigate how the local management institutions afterwards handled the contracts that it had with the WRC.

Ricketts (2002) and Mensah (2008) argue that “in the absence of funds to work, it is advisable for subordinates – agents – to stop working and renew, or return management contracts to their financiers”. Nevertheless, the outcome of interviews with some local chiefs indicated that the local management institutions continued to work, and even developed much interest in winning contracts to manage other natural resources in the district. The incidents surrounding that attitude (of an agent such as the local management institutions) to work even in the absence of resources, was confirmed by the head of a NGO popularly called Yen Poano. The head of the NGO hinted that the state management institutions usually covered-up for people who undertook illegal operations in the basin, and even took bribes from the trespassers; and that the practice was the main source of motivation to the heads of the state management institutions.

The motivation of the workers by the local management institutions to work is inconsistent with the findings of Clark and Sharf (2007), which say that agents are motivated to work when they are adequately resourced. The fact is that unlike the expectations of Clark and Sharf, the workers in the local management institutions used bribes that they took (from the miners especially) as extrinsic motivation to urge them to work.

The first general impression gathered from the field was that all the local management institutions could not perform satisfactorily because they faced extreme difficulties to get funds for their operations. It was later discovered that heads of the state management institutions rather took bribes

from some illegal users of the basin to cater for minor operational expenses.

The World Bank (2010) has observed that reprehensive behaviour causes top management institutions to neglect financial problems of lower-rank or subordinate institutions.

After the cases of bribery were reported, it became easy to find the causes of the financial constraints in the state management institutions, and their low levels of achievement. The poor performance of the local institutions confirms the assertion by the World Bank that bribery and corruption destroy work ethics, and are the major causes of incomplete project developments in developing countries.

Technical capacity of the local institutions

Closely linked to high performance levels of production is adequate technical capacity (Boedeltje & Cornips, 2012). With this in mind, an assessment of human resource and logistical capacities of the local management institutions was done. The outcome of the in-depth interview conducted showed that the local management institutions had many challenges relating to human resources and equipment, which caused them to perform below expectation. In terms of human resource capacity for operation, heads of the local management institutions complained of inadequate personnel (Table 10). In most cases, they stressed the need for government to recruit expert personnel who could bring on board scientific ideas for the management of the basin. To share their plight, this is what one of the heads said:

Government sends to us unqualified personnel without our consent. Very often we have to work with national service

just when they have acquired little experience, and then we have to request for new ones. The situation is so frustrating. We have now resorted to using national service personnel who we know are incompetent. Now we just do not know how to get workers for the task given to us.

Table 10: Human Resource Capacity of the local management institutions

Personnel	Institution	Quantity Available	Quantity required	Remarks
1. Finance and Administrative Managers	EPA	3	3	Adequate
	FC	1	3	Inadequate
	ABS	1	3	Inadequate
	YP	3	3	Adequate
	MMDAs	1	2	Inadequate
2. Plant and Equipment Managers	EPA	0	4	Inadequate
	FC	0	4	Inadequate
	ABS	0	2	Inadequate
	YP	0	4	Inadequate
	MMDAs	0	2	Inadequate
3. Community Development Officers	EPA	2	5	Inadequate
	FC	2	5	Inadequate
	ABS	1	8	Inadequate
	YP	3	10	Inadequate
	MMDAs	0	5	Inadequate
4. Research/Data Management Officers	EPA	0	2	Inadequate
	FC	0	2	Inadequate
	ABS	0	3	Inadequate
	YP	1	4	Inadequate
	MMDAs	1	2	Inadequate
5. Drivers	EPA	2	4	Inadequate
	FC	2	4	Inadequate
	ABS	0	2	Inadequate
	YP	2	4	Inadequate
	MMDAs	0	2	Inadequate
6. Security Officers	EPA	2	4	Inadequate
	FC	2	4	Inadequate
	ABS	1	2	Inadequate
	YP	2	4	Inadequate
	MMDAs	1	2	Inadequate
TOTAL		33	109	Inadequate

Environmental Protection Agency (EPA), Forestry Commission (FC), Ankobra River Basin Secretariat (ABS), Yen Poano (YP) and MMDAs (Metropolitan, Municipal and District Assemblies)

Source: Field data (2016)

In other interviews to assess the availability of human resources for operation, the heads of the state management institutions conceded that the local NGOs had adequate personnel in the areas of Geographic Information System (GIS) and Remote Sensing. This, according to the heads, equipped them with skills to win many research contracts from the World Bank Group.

With regards to logistics for operation, almost all the heads of the state management institutions expressed genuine concern about the poor state of their offices, ware houses, and vehicles for operation compared with the good ones (Figure 6) in one of the NGOs called Yen Poano. The deplorable state of vehicles (Figure 7) at the transport yard of the local branch of the Forestry Commission explains why state institutions had it difficult to organise workshops regularly to discuss pertinent issues on the conservation of the basin.



Figure 6: Good state of vehicles in at Yen Poano
Source: Field data (2016)



Figure 7: Poor state of vehicles at the Forestry Commission
Source: Field data (2016)

complained about inadequate miscellaneous tools such as cutlasses, boots, and uniforms to patrol the drainage basin. While the state institutions talked about bad state of offices, computers and accessories, their counterparts in the private institutions had modern facilities (Table 11) donated by the USAID and the World Fish Environment Sustenance, which enabled them to organise capacity-building workshops for their workers.

Table 11: Status of Equipment in the Local Management Institutions

Facilities/ logistics	Institution	Number Available	Number Required	Status of facilities
1. Container trucks	EPA	1	5	Good
	FC	1	6	Grounded
	ABS	0	7	–
	YP	0	5	–
	MMDAs	1	3	Poor
2. Compactor trucks	EPA	1	5	Good
	FC	2	6	Good
	ABS	0	7	–
	YP	0	5	–
	MMDAs	1	3	Good
3. Skin loaders	EPA	2	5	Good
	FC	2	6	Grounded
	ABS	0	7	–
	YP	0	5	–
	MMDAs	0	3	Poor
4. Patrol vehicles	EPA	1	5	Good
	FC	1	6	Grounded
	ABS	1	7	Poor
	YP	2	5	Ground
	MMDAs	1	3	Good
5. Apartments (number of offices)	EPA	8	10	Good
	FC	4	10	Good
	ABS	5	5	Poor
	YP	7	12	Very Good
	DAs	1	5	Poor

Environmental Protection Agency (EPA), Forestry Commission (FC), Ankobra River Basin Secretariat (ABS), Yen Poano (YP) and MMDAs (Metropolitan, Municipal and District Assemblies)

Source: Field data (2016)

On the whole, the state or the local management institutions did not have facilities to work with. On the other hand, the NGOs were averagely resourced; they generated their own funds, and received no assistance from government.

Legal capacity of the local management institutions

The Water Use Regulations and Legislative Instrument LI, 1692 of 2001 support local water resource management institutions to promulgate by-laws that address, among other things, unapproved uses of water resources in Ghana. Section 10 of the legislative instrument stipulates that, a person commits offence when he or she:

- *Fails to follow the right procedure to obtain water use permit before extracting surface or underground water from any drainage basin;*
- *Refuses to produce permit upon demand by any agent authorised by government to regulate the general development of drainage basin resources;*
- *Fails, or refuses to pay the prescribed penalty for illegal use of drainage basin resources;*
- *Indiscriminately discharges solid or liquid waste in drainage basins; and*
- *Refuses to pay the Water Use Permit and Drilling Licensing fee before using resources in any drainage basin.*

Section 2 of the Drilling Licence and Groundwater Development Regulations, 1827 goes on to prescribe penalties for any person who

Lower Ankobra River Basin. It states that:

“Any person who contravenes any of the provisions of the water resource management by-laws commits an offence, and shall be liable on summary conviction, to a fine of 100 penalty units (GH¢ 200.00: equivalent to US\$150 at the time) or a term of imprisonment not exceeding six months or to both. In the case of a continuing offence, a further fine of one penalty unit (GH¢ 2.00 equivalent to US\$1.5 at the time) shall be imposed after a notice in writing of the offence has been served on the offender.

The implication of the above is that there are sufficient deterrent laws and regulations to control unlawful extraction of resources from drainage basins in the country. The question now is: to what extent have these laws been enforced to achieve the results that government expects from the Lower Ankobra River Basin? Fukuyama (2009) argues that the extent to which traditional laws can be enforced largely depends on community support. Therefore, it was deemed important to assess the level of support received from the local people in basin at the law-enforcement stage of management.

An in-depth interview with the head of the Environmental Assessment Department of the EPA revealed that the local institutions faced challenges when they tried to enforce the management laws. The following submission, given by this head, illustrates the sentiments of the heads in the sister institutions who tried to enforce the basin-management by-laws:

Indeed, there is nothing more deterrent than paying GH¢ 200 for just touching a resource in the basin without permission.

When some of the local people are caught fishing or farming at unauthorised places, they call politicians who always plead for them to be set free. Indeed, we have no option than to set them free. If this negative practice does not cease, we shall continue to face challenges in enforcing the laws that govern the use of the basin's resources. The problem has always been with enforcement and arrest of offenders!

Inability of institutions to implement by-laws is highlighted in the IWM-framework (WRC, 2000) as the strongest factor that undermines the strength of management systems. Consequently, the inability of local institutions to enforce the aforementioned laws when political party representatives intervened, partly gave way to the indiscriminate extraction and utilisation of resources in the basin (Figures 8 & 9). This finding on the interferences from the local party representatives is underpinned by the World Bank (2004) Accountability (WBA) Framework, which identifies clientelism as one of the most influential factors that give politicians the opportunity to influence management decisions to favour their members.



Figure 8: Farmland destroyed by surface miners at Nsuta
Source: Field data (2016)



Figure 9: A lake destroyed by small-scale miners at Techiman
Source: Field data (2016)

When government realised the numerous legal challenges in the management of the Lower Ankobra River Basin, the WRC was mandated to establish a supervisory body officially called the Ankobra River Basin Secretariat (Odame-Ababio, 2010). The main duty of the Secretariat was to enforce all local by-laws, and to promote community participation using non-coercive strategies (Odame-Ababio). The Secretariat was to persuade and educate local users of the basin to accept their responsibilities to support local management institutions. Despite that special arrangement, the reports given by the head of the Ankobra River Basin Secretariat were that the non-coercive approach became discriminatory, and finally failed, even when the police and community tribunals in the district came in to solve the problem. The head's worries and disappointments from the poor work of the police and the community tribunals (to him), explained the lapses in the by-laws. He gave the following submission to emphasise his disappointments:

In fact, to get the support of the community tribunals to enforce by-laws regarding the use of this basin is a big problem. We

illegal users of the resources in the basin; but we have never been successful. You will be surprised to see that right behind our office are mining and sand wining activities going on and which we cannot stop! The miners have strongly warned us not to interfere with their work because it is their source of livelihood. We have reported them to the police on many occasions, but nothing has been done to them.

It is clear from the above that, even though the local management institutions established close links with the law-enforcement agencies to deal with offences in the basin, they were unsuccessful. This observation is consistent with the findings by Plummer and Slaymaker (2007) who have noted that non-compliance with state laws cripples local resource management institutions, and often causes poor performance.

Summary

A number of lapses related to the capacities of local institutions that made it impossible for resources in the Lower Ankobra River Basin to be conserved (leading to their appalling state), have been described. The weaknesses in the laws and regulations by government (i.e. the inadequate personnel, logistics, and funds) have been identified as the major obstacles that prevented the management institutions from functioning effectively. In many cases, there were differences between staff requirements and the actual staff strength at the operational or first-line stages of management, especially in the state institutions.

The chapter lists many deterrent laws and regulations that the local management institutions had tried to enforce, but had been unsuccessful. The inability of local management institutions to enforce the laws was caused by people in higher positions (chiefs and political representative) who muddled up the work of the institutions at the local level. The chapter described the situation as “a weak judicial system that adversely affected the management activities, which eventually led to the many indiscriminate uses of the basin’s resources”.



FUNCTIONAL NETWORKS OF THE INSTITUTIONS MANAGING THE LOWER ANKOBRA RIVER BASIN

Introduction

This chapter presents an assessment of the strength of the networks in the institutional management system of the Lower Ankobra River Basin. In so doing, the chapter examines the functionality of the linkages: the frequency of collaboration, co-operation, consultations and supervision of the institutions mandated to manage the resources of the Lower Ankobra River Basin.

Functional networks of the management institutions

Merrey (2011), and Saleth and Dinar (2012), opine that functional networks function as spark-plugs of dynamic management systems. The authors have observed that strong or dynamic management systems are as important as the physical resources needed for smooth operation and can be used to stop changing environmental conditions that negatively affect project developments. Hayward (2015) too has identified frequent consultations, collaboration and proper supervision by top management institutions, and cooperation among lower-ranked institutions as the best examples of dynamic networks that can ginger institutions to work effectively.

The above submissions guided the researcher to assess the functional levels of consultations and collaborations, among the three top management institutions (i.e. WRC, MWH and NDPC), and the levels of cooperation among the local management institutions (i.e. EPA, the FC, the ABS, the YP, the ADA, the WWDA and the NEDA) in the basin. The assessments of these

functional networks were done using qualitative research techniques, and are explained as follows.

Functional levels of networks among the top management institutions

To assess the functional levels of consultations and collaborations among the institutions at the top management level, in-depth interviews were conducted with heads of the institutions. Results of the interview generally showed weak collaborative networks among the WRC, MWH and the NDPC. The situation of weak collaborative networks was observed from the steps that the institutions took to discharge their duties. For example, during the discussions, the head of the MWH disclosed some policies (Appendix E) that his organisation had formulated in collaboration with the NDPC to direct the execution of projects in the basin. Similarly, the head of the NDPC mentioned a number of projects (Appendix F) that the institution had coordinated to support the WRC at the planning and allocation stages.

When the population in the Lower Ankobra River Basin increased (at 0.75% per month), there was increasing demand for land for settlement, and for other uses in the basin (GSS, 2013). The implication was that the WRC had the duty to constantly re-formulate and re-implement policies to direct future exploitations in the basin. Yet, a unit survey of the area by the present researcher revealed that there was unplanned development of projects which the top management institutions had failed to monitor. It was later on observed that the break in the teamwork gave the local people leeway to start projects (Figure 10) they deemed fit. The uncoordinated developments (of project) which were not detected and controlled in time were indications that the WRC neglected its supervisory duties.

The level of collaboration among the three institutions was strong at the initial stage of management; at the policy formulation stage; but it lasted for a brief period, while important duties such as frequent monitoring and evaluation of projects were neglected. Meanwhile, Rafaro (2004) has observed that monitoring and evaluation are two important operations that support management institutions to obtain desirable results. In contrast to the observation of Rafaro, the three top management institutions (the WRC, the NDPC and the MWH) failed to collaboratively assess and to reverse the negative impacts of project developments in the basin. These observations support Hardin's (1968) prediction that social resources are likely to be misused when institutions fail to perform all roles required of them. The above observation is an evidence to prove that the functionality of the networks among the top management institutions in the basin (the WRC, the NDPC and the MWH) was weak, (in particular) at the important stages of management.



Figure 10: Uncoordinated development of projects at Subriso
Source: Field data (2016)

Heckathorn and Maser (2001) have observed that conflicting roles create serious problems in resource management that are handled by different institutions. As such, Heckathorn and Maser (2001) have recommended strengthening of co-operation as the best approach that eliminates conflict of interest. In view of this, in-depth interviews were conducted to assess the strength and frequency of co-operation among the local management institutions, since they had been given similar mandates to operate, and need to work as a team.

The outcome of the interviews indicated that although the institutions co-operated, and together started projects, they failed to jointly monitor and evaluate the development of projects, and this indicates poor co-operation among them. For example, the institutions never teamed up to stop the haphazard project developments (Figure 10) because they were afraid of harassment by certain individuals who were armed while working in the basin. It was reported that some miners at Techiman, Bonsa and Nsuta attacked forest guards from the EPA and FC, and threatened to kill them when they (the former) attempted to arrest them. Even though the heads of the management institutions were not happy with such developments, they did not take joint action, or team up to ask the police for protection because they had earlier been disappointed by the police. This observation supports Merrey's (2011) assertion that breaks in team work among institutions with equal mandate, destroy horizontal co-operation, and affect adversely future delivery of responsibilities. It therefore became important to investigate how the local institutions delivered their duties afterwards.

The poor co-operation among the management institutions consistently manifested themselves in the poor delivery of duties that was reported by the local chiefs. During the interview section, it came to pass that some of the management institutions consistently gave counter instructions to individual users in the basin. For example, the head of the FC said its institution had, on many occasions, tried to arrest some users; but they produced permits endorsed by the Nzema East District Assembly (NEDA) even though it was not the assembly's duty to do that. Certainly, such pluralistic mandates weakened the legal section of the management system, and destroyed the co-operation among the institutions. This observation is consistent with the findings of Hardin (1968), that *legal pluralism* (struggle over power) tends to undermine management systems, and ultimately breaks collective action by stakeholders to successfully execute projects (Kimber, 1993). As a result, the heads became discouraged and neglected their responsibility of controlling illegal activities in the basin.

In the other interviews with particular chiefs, it came to light that the local institutions persistently failed to work together harmoniously. Such attitude destroyed the functionality of co-operation that was needed to connect the institutions to effectively achieve their goals. The break in co-operation is in contradiction to the team-work practices that have been highlighted by Joshi (2008) for improving institutional dynamisms. Joshi's endorsement has been supported by Hayward (2015) who laid much emphasis on the importance of frequent levels of coordination in management.

The poor network and low level of co-operation in the management systems caused the local institutions to implement programmes with different

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priorities to conserve the resources of the basin. The institutions apparently adopted the sectoral management approach. For instance, the GWCL confined its operations to the improvement of the quality of water from the basin, while the EPA implemented the Invasive Aquatic Water Project and the Water Hyacinth and Lettuce Projects to protect aquatic life in the Ankobra River. The heads admitted that they could not successfully follow the sectoral approach to complete any project. The failure of the management institutions to complete on-going projects, confirms the assertion by Townsley (1996) and Ozyuvaci (1997) that the sectoral approach is not the ideal for co-operative building projects.

In sum, the little integration of ideas and the low levels of co-operation that characterised local management institutions are evidence to show that the networks (dynamic linkages) among them are weak and non-functional.

Functional networks between management institutions and resource users

Heckathorn and Maser (2001) opines that trade-off issues between livelihood demands and environmental concerns should be addressed tactically in order to bring a “Win-win” benefit to stakeholders in management. In view of this, interviews were conducted to assess the strength of co-operation between, first, management and user institutions and second, between management institutions and individual resource users of the Lower Ankobra River Basin.

The heads of the user institutions said that they co-operated well with the management institutions. Although most of the by-laws that were implemented went against the heads, the heads realised they will help protect the resources of the basin. Hence, they tried as much as possible to obey them

(the laws) [University of Cape Coast https://ir.ucc.edu.gh/xmlui](https://ir.ucc.edu.gh/xmlui) For example, they applauded the management institutions for formulating the Water Use Regulations and Legislative Instrument LI, 1692, and the Drilling Licence and Groundwater Development Regulation LI, 1827 that helped to control mining activities in the basin. The user-institutional heads further intimated that they always assisted the management institutions to execute projects that sustained resources in the basin. The positive steps taken by the heads of the user institutions were narrated by the head of AngloGold Mining Company (AMC) that:

We saw the need to support the local management institutions to stop all bad practices in the basin. We have, over the years, completed a number of projects such as the Terracing and River Bank Restoration in the basin, to control for example, floods and erosion.

This submission was an example of collaboration between the user and the management institutions. When the institutions continued with their collaborative duties, the functional network among them became strong, and was harnessed for the development of projects in the basin.

The co-operation between the user and management institutions that was sustained during operations is in contrast to many of the approaches that failed when used to restore resources in basins such as the Inchaban, the Densu and the White Volta in Ghana (Odame-Ababio, 2010; Mireku, 2014). The implication of the example given is that a sound level of co-operation is needed in management systems to enhance effective execution of projects as observed by the UNDP and the GWA (2006).

To assess the level of co-operation between individual users and management institutions, issues regarding ownership and transfer of resources in the basin were discussed with the heads of the management institutions. During the discussions, the heads of the management institutions made reference to Section 12 and 13 of the Water Management Act, Act 522 that provided information on the rights and acquisition of land in the basin. This Act stipulates that:

The property in and around all water resources are vested in the President for and on behalf of, and in trust for the people of Ghana (12). The WRC is the agency authorised to regulate and control the use of water resources, through granting of water rights and water use permits (13).

The above clearly shows that ownership of resources in the basin was vested in the government that has the power and responsibility to distribute them to private users, or use them for social projects. In spite of this, the WRC, acting on the Water Use Regulation, LI 1692 of 2001, started issuing out various permits that allowed gold mining, oiling drilling and fishing activities in the basin when government saw the need to support the local people. The procedure to acquire any of the permits was outlined by the head of the WRC as follows:

Before the Water Use Permits are issued out, the applicant must:

- a. Apply to the local management institutions for inspection and approval of the proposed project site;*

- stakeholders that are the Town and Country Planning Department, Lands Commission, Survey Department and the Hydrological Service Department to discuss the potential benefits and the negative effects of the proposed project;*
- c. Apply to the WRC through the local drainage management institutions; and*
- d. Organise a second-phase public forum to discuss the project's benefits, impacts, and the date of commencement.*

After following all the above processes, the WRC then should instruct local management institutions to allow applicants to start the constructional phase of the said projects. This procedure must be repeated at all the stages of any project development.

The functional networks between individual users and the management institutions were investigated to ascertain whether the users co-operated; and followed the procedures for acquiring permits to work in the basin. The submissions by the heads of the local management institutions; the EPA, FC, and the NGOs, indicated that the users never co-operated; instead, they looked for avenues to get access to lands in the basin. For example, during the interviews, most of the individual users said they acquired portions of the basin through illegal means. It came to light that, 73 percent of the users purchased lands in the basin from landlords and local chiefs, while 27% inherited portions of the basin (Table 12). By using illegal means, individual

users jumped the procedures spelt out by government in the Water Use Regulation, LI 1692 of 2001.

In another interview, the heads of the user institutions admitted that the procedure for obtaining Water Use Permits was too long and cumbersome. To them, it was the main reason why individual users avoided the procedure to obtain Water Use Permits. They preferred to pay bribes to get portions of the basin. One of the users advised government to take steps to correct the practice when he said that:

Indeed the procedure to get the Water Use Permit is quite cumbersome. To get this licence, one has to go through a number of processes. Sometimes individual users take several months to visit the local management institutions to obtain the permit. I sometimes pity them. It is about time the government puts in measures to check this unacceptable practice.

The evidence provided by the heads of the user institutions explains the non-co-operative attitude of the individual users. Such non-cooperative attitude that manifested in the haphazard development of projects could have been stopped if the local institutions had used the Short Accountability Route (cell SR) of the World Bank (2004) Accountability Framework (Figure 1) to petition the WRC, the overall management institution. That would have been helpful because the World Bank has observed that the short accountability route always allows top management institutions to promptly receive local concerns and, by the same route, provide timely and amicable solutions. The above observations are supported by Bellamy, Ewing and Meppem (2002) who also added that the introduction of appropriate routes of communication

in any resource management system is a way of giving opportunity to local communities to contribute valuable ideas towards project management, promoting fairness in decision making, and facilitating consensus building.

The above is the approach that should have been used by the district management institutions to resolve the litigations surrounding the ownership and transfer of resources of the basin to prospective users.

Table 12: Approaches to land acquisition by individual users of the basin

User groups	Total number (n)	Purchased from a landlord (%)	Purchased from a chief (%)	Inherited from relatives (%)	Total from each cluster of users (%)
Farmers	78	30	19	51	100
Fisher folks	66	38	45	17	100
Sand miners	43	70	7	23	100
Mineral miners	55	82	9	9	100
Grand Total	242	220	80	100	400

Source: Field data (2016)

Summary

The assessment of the functionality of linkages among the top drainage basin management institutions shows that the NDPC and the MWH collaborate poorly to support the work of the WRC. The NDPC and the MWH only formulate policies on drainage basin usage, and on project coordination, but often neglect the important follow-up duties that ensure that policies are implemented. The result is that little has been done about monitoring,

evaluation, and assessment of achievements over the years. The linkages among local management institutions, to a large extent, were not functional. That happened because the institutions adopted the sectoral management approach to develop projects independently with little consultations among themselves. The level of coordination between chiefs and management organisations is low because these parties compete for ownership and management of the resources in the basin. Individual users, particularly miners, cooperated poorly with local management institutions when they found alternative means for acquiring lands in the basin for economic activities.



CHAPTER SEVEN

APPROACHES AND PRINCIPLES FOR SHARING RESOURCES IN THE LOWER ANKOBRA RIVER BASIN

Introduction

This chapter evaluates approaches and principles for sharing resources of the Lower Ankobra River Basin. It first investigates to establish whether the institutions are using approaches or principles for management. The chapter goes further to evaluate the approaches or the principles that have been followed by the local management institutions to distribute, or share the resources in the basin for its users.

Approaches and principles for sharing the basin's resources

According to the World Bank (2010), the important approaches that must be followed by resource management institutions should be policy formulation and implementation, project design and building, and project monitoring and evaluation. The World Bank has again listed transparency, accountability, participation, legitimacy, equity and ethics as guidelines that must form part of any management system designed for effective distribution of social resources. Hence, during the present study, opportunity was given to the users and the local chiefs to evaluate the approaches or the principles that were used by the institutions to distribute the resources of the basin. The evaluation has been organised into two phases. The first looks at the management approaches; it describes and explains how policies were formulated and implemented. The second part looks at the nature of the management principles that were put in place to regulate the extraction of resources from the basin.

Approaches to share the resources in the Lower Ankobra River Basin

Evaluating the approach to policy formulation and implementation for resource sharing

Individual users of the Lower Ankobra River Basin were given the opportunity to evaluate the approach used by local management institutions to formulate and implement policies using a four-point likert scale: 1 = *strongly disagreed*, 2= *disagreed*, 3= *agree*, 4= *strongly agreed*. Table 13 presents the details under two main sub-themes which are the approach to policy formulation, and the approach to policy implementation, used by the management institutions to share resources of the basin.

Table 13: Respondents’ view on the approach to policy formulation and implementation

<i>Key variables assessed</i>	<i>n</i>	<i>Strongly agreed f (%)</i>	<i>Agreed f (%)</i>	<i>Disagree f (%)</i>	<i>Strongly disagree f (%)</i>
Approach to Policy formulation					
Management institutions used ideas of local people to formulate policies	242	180 (74%)	40 (17%)	10 (4%)	10 (4%)
Approach to Policy implementation					
New policies were disclosed to local people before implementation	242	170 (70%)	30 (12%)	22 (9%)	20 (8%)
Institutions implemented policies based on the advice of local people	242	5 (2%)	7 (3%)	158 (65%)	72 (30%)
Policies were re-implemented when failure is detected	242	22 (9%)	13 (5%)	38 (16%)	169 (70%)

Scale: 1 = *strongly disagreed*, 2= *disagreed*, 3= *agree*, 4= *strongly agreed*

n = sample size (242)

Source: Field data (2016)

With regard to how policies were formulated, 74% of the individual users strongly agreed that management institutions solicited views before they started developing projects in the basin. However, when it came to project diversification (changing of projects) to support economic activities in the basin, only a few individual users (4%) strongly disagreed that the management institutions never involved the local people. Although some individual users disagreed, most of the local chiefs supported the assertion made by the majority group (180 or 74%), and went further to show documents containing several policies (Appendix I) that were designed based on the ideas of the users. Thus, the implementation of management policies to share resources of the basin was done based on the suggestions from the local people. The first to commend the heads of the local management institutions in this regard was a local chief who recalled the following:

Officials from all the management institutions always come to me to ask for my views on a number of projects for the conservation of resources in the basin. Very often, the management institutions task us to get the views of the local people for policy making and implementation. To assist the management institutions in this regard, we send a team from our research department to ask the farmers how best we can manage the basin. I want to commend the officials in the local management institutions for involving us when formulating policies. We are ever ready to support them to implement policies.

This submission is a clear indication that the local institutions were using the Indigenous-Knowledge Approach (WRC, 2000), which had been adopted by the Goso River Basin Management Institutions (Arthur & Moore, 1999). The management institutions were thus hopeful to get positive results with the approach. Meanwhile the WRC advised that for Indigenous-Knowledge Approach to produce good results, management institutions must implement all policies involved in the approach.

When it came to the issue of implementation of policies, a significant number, 158 (65%) of the users agreed that the management institutions had failed, while 2 (2%) commended them for having worked effectively (Table 13). The view point of those who agreed was that the local management institutions implemented policies that encouraged illegal mining, and neglected those concerning improper fishing and farming. In that case, the fisher-folks and farmers had leeway to disobey the policies governing the management of the resources in the basin.

When policies were implemented to favour the miners, the other user groups felt cheated and decided to disobey the rules set for them. For example, the miners took advantage of the opportunity given to them to over-extract resources in the basin. For example, while some flooded farmlands through water spillage (Figure 11), others polluted water bodies in the basin (Figure 12).



Figure 11: Farmlands flooded with water spillage by surface miners at Nsuta
Source: Field data (2016)



Figure 12: A lake destroyed by small-scale miners at Techiman
Source: Field data (2016)

Hardin (1968) has stated that “ruin is the destination towards which men rush when they each pursue their own interest in a society that believes in freedom of the commons”. Similar to the above statement made by Hardin, the farmlands in the basin got destroyed after the miners had over-extracted the resources, and had increased their incomes more than the other user groups (farmers, fisher-folks and sand winners) (Figure 13). The differences in incomes of the users (from January to June, 2016) caused much intensification and over-extraction of the water bodies, and other resources in the basin. The

result was more destruction of the basins' environment which the management institutions were unable to repair.

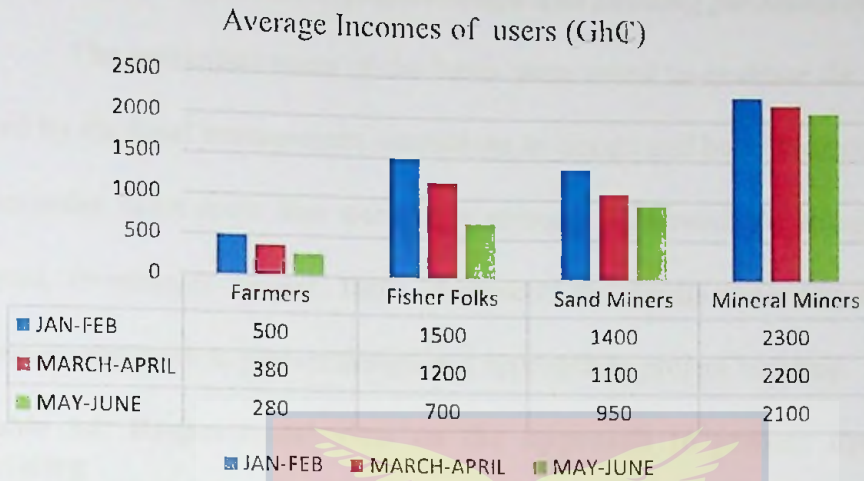


Figure 13: Decreasing incomes of the individual users (farmers, fisher folks, sand miners and mineral miners) from January to June 2016
Source: Field data (2016)

The wrong approach adopted by the local management institutions to implement policies on resource exploitation in the basin was confirmed by one of the chiefs who had observed that the situation was getting out of hand. He remarked as follows:

It is very sad for us to see the basin in this poor state. In my view, local management institutions must be held responsible for this. They always condemn miners for causing the degradation of the basin; meanwhile, there are other environmental devastating activities such as chemical fishing going on which the management institutions fail to control (Chief of Bonsa).

The above confirmation means that the local authorities knew about the illegal exploitation of the resources in the basin but failed to stop it by following either the short or long accountability routes prescribed by the World Bank

(2004) Accountability Framework (Figure 1) for equitable sharing of social resources.

Evaluating the approach to project design and building for resource sharing

The individual users of the basin were asked to evaluate the approach used by the local management institutions to design and build projects, using a four-point likert scale that were: 1 = *strongly disagreed*, 2= *disagreed*, 3= *agree*, 4= *strongly agreed*. Table 14 presents the results under two main sub-themes: approach to project design and approach to project building.

Table 14: Respondents’ view on the approach to project design and building

<i>Key variables assessed</i>	<i>n</i>	<i>Strongly agreed f (%)</i>	<i>agreed f (%)</i>	<i>Disagree f (%)</i>	<i>Strongly disagree f (%)</i>
Approach to Project design					
Project designs were based on ideas of the local people	242	180 (74%)	40 (17%)	13 (5%)	9 (4%)
Basin projects were re-designed	242	190 (78%)	30 (12%)	15 (6%)	7 (3%)
Approach to Project building					
Jointly built project arrested negative practices	242	21 (9%)	20 (8%)	31 (13%)	170 (70%)
Projects built with local materials	242	19 (8%)	23 (10%)	50 (21%)	150 (62%)
Multiple approaches for project implementation arrested negative practices	242	30 (12%)	40 (17%)	72 (30%)	100 (41%)

Scale: 1 = *strongly disagreed*, 2= *disagreed*, 3= *agree*, 4= *strongly agreed*

n = sample size (242)

Source: Field data (2016)

Table 14 shows significant number of users (74%) who strongly agreed that each management institution designed its own project, while only 4%

strongly agreed that the institutions designed projects together. The agreement of the majority was confirmed by the heads of the management institutions who admitted that management institutions only used experts from their head offices to design projects.

The implication of the above finding is that the management institutions set aside the WRC (2000)'s Indigenous-Knowledge Approach, and started designing projects based on what Narwal et al. (2003) described as the Top-down Approach. At that stage, the approach to project design became discriminatory, and produced characteristics similar to those that caused problems to the institutions that were charge with the management of the Inchanan River Basin in the Western Region of Ghana (Mireku, 2014). This means that the institutions are likely to face challenges *haven* adopted multiple approaches. In due course, the task ahead of them was to solve the problems that have emanated from the improper use of the Indigenous-knowledge and the Top-down approaches to design projects, before proceeding to the project building or implementation stage.

When it came to the building of projects, 9.6% of the individual users agreed, compared with 57.7% who strongly disagreed that the local management worked satisfactorily. The main reason given by those who strongly disagreed was that the heads of the institutions discarded the designs that had valuable suggestions from the local people, and implemented those presented by their top managers. Events such as the above led Dukes and Firehock (2001) to caution community-based management institutions not to shelf local ideas while carrying out management duties in order to attract community participation. Although the management institutions in the

Ankobra River Basin built several projects to conserve the resources, they hardly succeeded because of the poor support they had from the individuals who used the basin.

According to the local chiefs, the materials that were used for construction were fragile (Figure 14), and could not prevent, for example, erosion, or floods in the basin after the miners heaped sand over them. As a result, many of the farmlands in the basin were destroyed (Figure 15) by surface run-off after heavy rains in the basin. The worries of users, particularly the farmers, were confirmed by the chief of Nsuta who said that:

I do not understand why management institutions waste so much time to call for many meetings while they cannot come up with any good project that will protect the resources in the basin. They must begin to know that government pays them to work, no matter the challenges that come their way. At the moment it appears they have put the management of the basin into the hands of local people who do not have the right materials to control erosion in the basin. The institutions complain about inadequate funds and logistics to work. I think they should find the way out of this management challenge.



Figure 14: Fragile structures built to control erosion in the basin
Field data (2016)



Figure 15: Farmlands covered with sediments after a heavy rainfall in the basin
Field data (2016)

Majority of the institutional heads admitted that they used different approaches to conserve the resources in the basin. According to them, some of the institutions formulated policies with local ideas, later implemented projects using the advice of some top managers, and finally, implemented projects

independently. That meant that the institutions moved away from the Indigenous-knowledge Approach to Top-down Approach, and later adopted the Sectoral Management Approach. Going through the rudimentary processes of these approaches, the institutions became disorganised. This confirms the assertion by Paudel (2000) who observes that the use of multiple approaches causes disruptions in institutional arrangements.

Using the Sectoral Management Approach, it came to light that the institutions executed projects differently. For example, it was reported by the local chiefs that the FC confined its operations to protect the trees in the basin and the EPA too implemented projects such as the Invasive Aquatic Water Project, Water Hyacinth and Lettuce Projects to protect aquatic life and improve the quality of water from the basin. The MoFA and the IDA, on the other hand focused on soil rehabilitation projects. In fact, the institutions followed the WRC's (2000) Integrated Water Resource Management Framework that prescribes collaborative roles for water resource management institutions. However, they abandoned the collaborative roles and executed projects differently, particularly when they adopted the sectoral approach. This explains why they became unsuccessful to conserve the basin's resources. This is consistent with the findings of Paudel's (2000) that the use of sectoral approaches for resource management breaks team work, and leads to failure.

The weaknesses of the sectoral approach to project implementation was a major concern to the fisher-folks who complained about the illegal activities of the gold miners and sand winners that muddied the waters of the major river, River Ankobra in the basin (Figure 16).



Figure 16: River Ankobra muddied by gold miners and sand winners in the Basin

Source: Field data (2016)

On the other hand, the miners in the basin embraced the sectoral management approach because they realised that when the institutions worked independently, they had the chance to mine all the time. The results of their intensive mining activities were the massive sedimentation of River Fure (Figure 17) that formerly supplied many of the villages with fresh water, and the heaps of sand in residential areas in towns such as Nsuta (Figure 18).



Figure 17: Massive deposits of sediments into River Fure due to mining activities

Source: Field data (2016)



Figure 18: Sand heaped in residential areas in a village called Nsuta

Source: Field data (2016)

The rapid depletion of the resources in the basin caused 41% of the users to express their displeasure with the multiple approaches used so far, and called for better integration of programmes that can prevent the depletion of resources in the basin, as observed by Ozyuvaci (1997).

Evaluating the approach to project monitoring and evaluation for resource sharing

Individual users of the Lower Ankobra River Basin evaluated the approach used by the management institutions to monitor and evaluate projects using the four-point likert scale: *1 = strongly disagreed, 2= disagreed, 3= agree, 4= strongly agreed*. Table 15 presents the details under two main sub-themes that are approach to project monitoring, and approach to project evaluation.

Table 15: Respondents' view on the approach to project monitoring and evaluation

<i>Key variables assessed</i>	<i>n</i>	<i>Strongly agreed f (%)</i>	<i>Agreed f (%)</i>	<i>Disagree f (%)</i>	<i>Strongly disagree f (%)</i>
Approach to Project monitoring					
Monitoring was done with users to check projects and practices	242	165 (68%)	38 (16%)	21 (8%)	18 (7%)
Monitoring was successful with the support of the local NGOs	242	27 (11%)	18 (7%)	58 (23%)	139 (57%)
Management institutions tasked the district assemblies to monitor practices	242	157 (64%)	37 (15%)	24 (10%)	24 (10%)
Approach to Project evaluation					
Institutions often reviewed project developments with the user groups	242	20 (8%)	25 (10%)	30 (12%)	167 (69%)
Institutions were successful with the help of the NGOs	242	18 (7%)	15 (6%)	56 (23%)	143(59%)
Institutions were successful with the help of the District Assemblies	242	12 (5%)	41 (17%)	52 (21%)	137(56%)

Scale: 1 = *strongly disagreed*, 2= *disagreed*, 3= *agree*, 4= *strongly agreed*

N=total population (242); n=number of responses

Source: Field data (2016)

Responds from the respondents shows that majority (165 or 68%) of the users agreed that the (local) management institutions eventually relied on volunteers to stop or arrest illegal users of the basin's resources. Thus, after trying all other means, the local management institutions now gave opportunity to the individual users to support with the monitoring exercises. The monitoring exercises became unsuccessful because the individuals who were invited to assist the institutions hinted their colleagues who run away before government officials arrived. This move gave way to some of the users to exploit the

resources without care. Consequently, the monitoring exercises by the management institutions were unsuccessful.

After the failure of the monitoring exercises, the management institutions handed over some of their responsibilities to the NGOs acting in the basin. Even with the involvement of the NGOs, supervision never improved. About 57% of the individual users complained about illegal activities such as water abstraction and dredging by their colleagues, all of which affected farming and fishing activities in the basin. For example, the fisher-folks lamented about the re-location of some special species of fish after the rivers were polluted, while the farmers talked about the excessive abstraction of water that caused the reduction in the amount of water available for irrigation during the dry season. The implications from the above findings are that the individual users wanted improvement in the monitoring exercises. But the difficult question was whether they were prepared to take part in the monitoring duties.

As a result of the poor management of the resources in the basin, the local management institutions decided to train some people from the MMDAs in the basin to assume the monitoring duties. Indeed, that decision was encouraging because the administration over drainage basins has, since 2001, been given to the MMDAs in Ghana under Section 11 of the *Water Use Regulation Act of 1962 of 2001* (Opoku-Agyemang, 1998). By this Act, it was the duty of the three district assemblies in the basin [i.e. the Wasa Amenfi, the Wasa West and the Nzema East] to support the monitoring programmes that the local institutions initiated. Unfortunately, the Assemblies neglected their duties when they realised that the Act (the *Water Use Regulation Act of 1962*

of 2001) indicated that the same monitoring duties should be taken up by the local institutions. They took an advantage of the conflicts (of duties) created by the Act, *shirked* their responsibilities, and even connived with some of the trained people (or those who took monitoring duties), and issued fake Water Use Permits to those who paid bribes. It was discovered that the Assemblies did all the above to make the work of the local management institutions more difficult, so that they could get the opportunity to issue fake permits.

The poor monitoring and evaluation by the trained personnel negatively affected the activities of user institutions such as mining and water treatment companies in the basin. For example, an interview with an official of the GWCL, Ankobra Branch, revealed that the fishermen used chemicals to fish while the miners muddied the main rivers using the Chinese-made machine called 'Tototo' by the local people. To show how serious the situation was, the local head of the Branch presented documents that showed an annual increase of 39% in the cost of water treatment, from 2010 to 2015. Again the head of the GWCL reported that the water level in the Ankobra Dam went down (Figure 19), by 2327.26 cubic meters during the dry season of 2015. During the interviews, the head recalled some complaints from the surrounding communities concerning the irregular flow of treated water to Prestea and its environs. He had the following to say about the poor approach to project monitoring in the basin:

For the past four years we have not been able to meet the demand on the market. In the past we were able to supply ten thousand people with potable water; currently, the number has reduced to four thousand due to the falling level of water

in the dam. There are several illegal activities such as farming, fishing and mining in the basin that have cost us so much.

The illegal exploitation of the resources in the basin certainly was an indication that the approaches adopted by the institutions to monitor and evaluate project developments were inappropriate, and could not support economic activities in the basin. Consequently, the income levels of both the individual users and the user institutions got reduced over the years.



Figure 19: The Ankobra Dam at its lowest water level

Source: Fieldwork (2016)

Principles for sharing the resources in the Lower Ankobra River Basin

According to Allmendinger (2008), the application of effective management principles helps to identify and address social malfeasants such as corruption and embezzlement of funds. Allan and Curtis (2005) have also argued that the use of good management principles contribute to the soundness of existing systems and processes that support institutions to work efficiently. In view of the above, there was the need for the study to evaluate the

effectiveness of the kinds of management principles that were used by the institutions to regulate resource extraction from the basin.

To evaluate the principles used to share resources in the basin, in-depth interviews were conducted with the heads of the local institutions. The findings from the interviews indicated that government had outlined principles to guide the work of all the institutions in charge of management of the basin. For example, some sections of the Mission Statements (documents containing organisational principles) of the WRC, the EPA, the FC and the NGOs had the same principle that read as follows:

The agency shall ensure accountability and efficiency in the management of water resources to support any approved economic activity... The agency shall promote fairness and equity in the sharing of local water resources.

From the above, the principles of accountability, efficiency and equity or fairness for resource distribution have been emphasised by government. The study therefore investigated how they have been used to share the resources of the Lower Ankobra River Basin. The investigations were organised under three main sub-themes, they are; evaluation of the principle of accountability, evaluation of the principle of efficiency, and evaluation of the principle of equity for sharing resources of the basin. The details of these approaches are analysed as follows.

Evaluation of the principle of accountability for sharing resources of the basin

Plummer (2007), and Vaughan and Tronvoll (2008) hold the view that the best way to measure accountability is to assess the available platforms or

channels of communication that have been used to disclose information on how resources should be used by management.

To evaluate the levels of accountability, interviews were conducted to determine the ways, and the extent to which the local institutions opened up to the surrounding communities on management activities relating to the use of resources provided by government. During the interviews, the heads of the management institutions admitted that they never mounted any platform to brief the users on how they (the institutions) used resources. The heads also reported that the cordial relationship that they earlier on established with the users got broken, when the users continued to misuse resources in the basin. As a result, the management heads regarded the individual users as non-cooperative, and hence did not engage them (the individuals) on issues concerning accountability.

The practice of management not rendering accounts to the local people in the basin had existed for a long time. There was no institution or agent to help the users to demand accountability from the management. Meanwhile, one of the important roles given to the Unit Committees (Structure of Local Government of Ghana, 1994) was to petition the MCEs to help in the development of social projects. Yet, in the interviews, the MCEs admitted that they refused to take up that role because they felt the users were ignorant about issues on accountability. One of them gave the following reasons to defend his colleagues:

We are aware that we must help the users to demand accountability from the management. But, will the users understand the budget components of the management

institutions? Several of these budgets have technical components that are not easily comprehensible even to literates. Anyway, we have plans to call for community engagements and use the opportunity to brief users on accountability issues. But I doubt if they will come and listen. They will certainly turn down our invitation!

Upon further interviews to assess the measures put in place to ensure accountability, the heads of the management institutions described the strategies that they had taken to educate the users on sustainable exploitation of the basin's resources. They were however silent on how they had used the channels and resources provided by government to regulate the extraction of resources from the basin. Most of the heads regarded the engagements they have had with users during policy formulation as the education they have given on resource use. This is what the head of the EPA said about how his institutions rendered accounts to individual users:

We have had several stakeholder meetings with users. During such gatherings, we educate them on safe uses of the basin, and also ask for the views on how best the basin should be managed. I can confidently say that we always factor their views into our designs, and the implementation of projects. A few examples of the projects are the Flood Warning Strategy, the Project Management Strategy, and the Maximum Livelihood Gains Strategies.

Interviews were conducted with the head of the WRC to find out whether the local management institutions had ever accounted for the use of

resources received from government. During the interviews, the head commended the heads of the EPA, the FC, and the ABS for having submitted good reports on how they used the resources provided by government. The implication here is that, the local institutions worked with the principle of transparency because they provided official information to their superior, the WRC. Here again, the question was: whether the local institutions ensured transparency at the local level of management too? This question becomes relevant because Butterworth (2015) advises resource management institutions to pay particular attention to transparent approaches (open strategies), because they are able to attract valuable local ideas for successful management.

The WRC assumed that once the local management institutions had worked with the principle of transparency, they were accountable to the individual users. As such the WRC did not consult the users for further information on how the local institutions had used government's resource to improve the economic status of users of the basin. The practice, though persisted for some time, was not corrected by the WRC.

It is clear that whereas some of the heads of the management institutions had replaced accountability with educating local people and showing transparent documents to higher authorities, others thought accountability to local people was not necessary at all. In many cases, the institutions that rendered account did that for the top management institutions so as to hold on to their jobs. They neglected the users at the grass root, even though the practice (of ensuring accountability) has been recommended by Butterworth (2009) and the World Bank (2009) to attract local participation in management.

Christiansen, Coyle and Lockhart (2010) recommended a legal support to facilitate the processes involved in promoting accountability. The authors have suggested that accountability management approaches should always be supported by strong state judicial workforce when internal legal structures of a management system become weak.

The above suggestions drew the attention of the present researcher to find out whether the legal institutions in the basin exercise power to bring management institutions to order, when they have failed to render accounts to the local people. The outcome of the interviews proved that the Police and the Legal Departments in the three District Assemblies in the study area, also failed to exercise authority to mandate the local institutions to render account periodically rather than educating the users on best practices.

In sum, all the institutions (the management institutions, District Assemblies, the Police and the Legal Departments in the basin) failed to ensure accountability to support the users. Even when an attempt was made, a wrong approach was used, similar to that which caused failure in some Asian countries namely South Korea, Pakistan and India, where little provision was made for educating local people on issues of accountability (World Bank, 2009). Consequently, when the local users observed that the management institutions had deliberately refused to render accounts, some of them followed their footsteps and over-extracted the resources, and that negatively affected the output of some of the users, as stated earlier.

Evaluation of the principle of efficiency for sharing resources of the basin

Morrison et al. (2009) have described efficient management systems as structures put up to effectively manage resources on behalf of beneficiaries.

Based on the description of efficient management systems suggested by Morrison et al., an evaluation was done in the present study to find out if resources invested in the management system produced desired results.

During the evaluation, the heads of the management institutions intimated that they had limited funds and logistics to support the work of the user groups in the basin. The users (both individuals and institutions) commented on the decline in their output since 2015. The heads gave accounts that were contrary to what the users said. According to the managers, machines, vehicles, and facilities such as buildings were acquired by the users. The heads described the users as 'pretenders' and gave several reasons to support their stand. The heads (*a & b*) of the two institutions had these to say:

- a. Reports made by local people concerning the level of efficiency in the local management institutions are false. The resources that individual users extract from this basin are just enough, but they always say they obtain nothing from the basin. Some of them, especially the users I know, have acquired valuable assets such as buildings from what they obtain from the basin (the head of the EPA, 2016).*
- b. Individual users in the basin are ungrateful to us. They describe us as being inefficient. If we had not supported them well, their activities would have collapsed by now. Look! Every user of this basin increases his or her gains all the time. For example, the mining companies and others have acquired new assets. But they do not want to disclose*

their gains from the basin for fear that government will stop them (the head of the WRC, 2016).

Several questions were asked about how the principle of efficiency was applied by the institutions. The answers pointed to the fact that the heads did not understand what 'efficient management principle' meant; they misconstrued it to be 'the ability of users' to intensify the extraction of resources from the basin. The heads gave responses that indicated that users acquired resources (wealth) through their own efforts. Hence, they (the local management institutions) did not make much effort to implement projects that would improve production for the users; they thought that the users were over-exploiting the basin's resources, and they did not need any management institutions to support their activities.

Evaluation of the principle of equity for sharing resources of the basin

According to Olsson et al. (2004), equity management principle concerns the ability of leaders and public organisations to uphold the rights of citizens, and to address their needs fairly. Consequently, it became important in the present study to evaluate the mechanisms that had been put in place to ensure that all local users had equal opportunity to extract resources to support their livelihood. The interview revealed that local management institutions only gave instructions to users on the sustainable ways of extracting resources from the basin. That was the only form of education given to ensure equity. Excessive sand winning, gold mining and fishing activities were reported to have caused the loss of vegetation in the basin, and also to have caused deep gullies (Figure 20) through which sediments were carried into the principal streets and homes in the basin (Figure 21).



Figure 20: Deep gullies at Bonsa due to excessive sand winning activities

Source: Field data (2016)

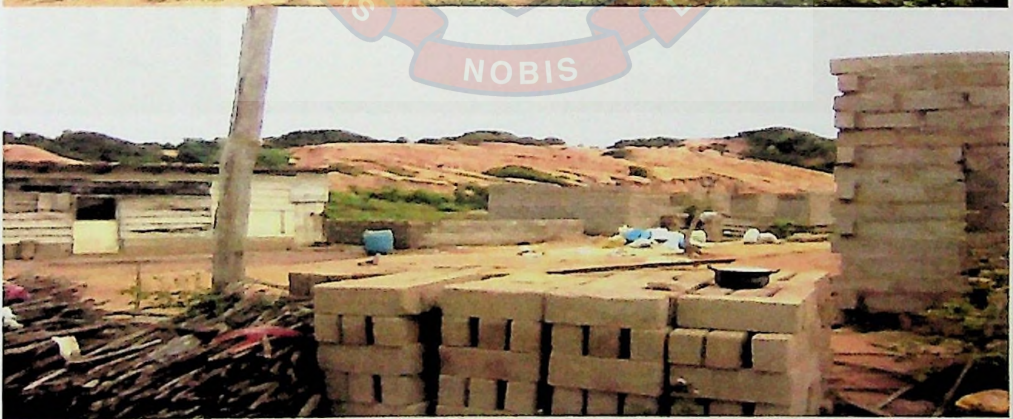


Figure 21: Sediments from sand winning that has filled streets and some homes at Bonsa

Source: Field data (2016)

Because management institutions relaxed on their duties, miners took advantage to claim more fertile lands from the farmers. Consequently, most of

the farmers had limited land for expansion, and they applied fertilizer to maintain their yield. The excessive use of fertilizers burned much of the output of farmers. For example, excessive use of super phosphate ($\text{CaH}_4\text{P}_2\text{O}_8$) and potassium sulphate (K_2SO_4) destroyed much sugarcane (Figure 22) at Ayawora, a settlement where sugarcane cultivation is a dormant occupation for many.



Figure 22: Sugarcane destroyed by excess application of super phosphate ($\text{CaH}_4\text{P}_2\text{O}_8$) and potassium sulphate (K_2SO_4) at Ayawora
Source: Field data (2016)

In terms of equitable sharing of lands in the basin, it was observed that illegal mining, and sand winning activities took many hectares of lands reserved for infrastructural development. Consequently, some local people started erecting buildings along waterways (Figure 23), and in the Bonsa and the Nkontoben forest reserves that are located in the basin. To substantiate

these field observations, the EPA showed to the present researcher, a 7.8% increase in built-up areas that had encroached on forest reserves in the basin.



Figure 23: Buildings erected along water courses, near River Nwhini at Asomaase No. 2
Source: Field data (2016)

To unearth other factors that were responsible for the inequitable utilisation of resources, the perceptions of the users about the importance of the basin's resources were solicited. This interview became necessary because the perceptions learnt, may support the explanations of the factors that caused the up-surge of exploitation of the resources in the basin. Table 16 presents the user's perceptions with respect to socio-demographic characteristics (sex, age and occupation) of the respondents. To give a better interpretation of the results, the initial five-point likert scale was reduced to three ($1-1.49$ =strongly disagree, $1.50-2.49$ =agree, $2.50-3$ =strongly agree).

First, an independent-samples t-test was conducted to compare the perceptions that male and female users had about the productive, religious and educational benefits of the basin. The outcome of the test indicated a significant difference in the perceptions of males and females about the

productive benefits: males ($M=2.71$, $SD= 0.26$) and females [$M=2.81$, $SD= 0.30$; $t (242)= -2.01$, $p=.047$]; religious benefits: males ($M=2.20$, $SD= 0.51$) and females [$M=2.40$, $SD= 0.44$; $t (242)= -2.57$, $p=.011$]; and finally educational benefits of the basin: males ($M=1.94$, $SD= 0.51$) and females [$M=2.33$, $SD= 0.70$; $t (242)= -3.57$, $p=.000$]. The marginal differences in the average or mean (M) perceptions about the various benefits (productive, regulatory, religious and educational) of the basin were indications that, the two groups of users (males and females) were going to handle the resources of the basin differently. On the whole, the females users had a higher average perception ($M=2.81$) than the males ($M=2.71$) about the religious, regulatory and educational benefits of the basin.

The implication of the above is that the females are likely to handle the resources in the basin better than the males. Hence, about 90 percent of the females use conservatory techniques such as terracing and coppicing while farming in the basin. Whereas, the male users had less varying views ($SD=0.26$) than the females ($SD=0.30$), that the resources should be used mainly for production. By implication the males agreed, to some extent, that the basin's resources are mainly for production. This explains why about 80 percent of them engaged in high-income generating activities such as illegal mining and sand winning activities that destroyed farmlands, and even forced 75% of the farmers to cultivate in waterlogged areas of the basin; a situation that resulted in a fall in their output and incomes (see Figure 13, p. 147).

To examine the perceptions of the users about the benefits of the basin according age groups, a one-way analysis of variance (ANOVA) was employed. However, to obtain reliable results, the users were categorised into

four age groups (Group One: <20; Group Two: 20-24; Group Three: 25-29; and Group Four 30+). The results of the analysis of variance (ANOVA) showed significant differences at $p \leq 0.05$ in the perceived productive benefits [$F(3, 242) = 6.680, p = 0.000$]; religious benefits [$F(3, 242) = 3.67, p = 0.014$]; and educational benefits [$F(3, 242) = 2.98, p = 0.034$] of the basin. Thus, the different age classes of users had different perceptions about the benefits of the basin, and this explains why they mounted different strategies to over extract the resources of the basin causing disproportions in the incomes obtained (Figure 13, Pages 151-153; Average Income of Users). For example, during the interviews, the chiefs confirmed the observation that users in the active age groups (Group One: <20; Group Two: 20-24; and Group Three: 25-29) worked late into the night to extract more resources than the older age groups. This, according to the local chiefs, made the users in the active age groups richer than those in the older age groups.

On the perceptions of individuals from the various occupational groups about the benefits (values) of the basin's resources, post-hoc comparisons using the Tukey's Honestly Significant Different (HSD) test indicated that the mean score for the mineral miners ($M = 2.50, SD = 0.54$) and sand miners ($M = 2.64, SD = 0.41$) were significantly different from those of the farmers ($M = 1.95, SD = 0.39$) and the fisher-folks ($M = 2.15, SD = 0.14$). The main reason for this occurrence was that those who engaged in mining (whether mineral or sand) realised that the basin has many productive benefits; they reasoned that the basin's resources were self-renewable no matter how they are exploited. Therefore, they decided to mine gold and win sand where possible. The result was that, access to the other users was curtailed. These factors – sex and age,

further explain the reasons for the haphazard utilisation and the unequal sharing of the resources of the basin.

Table 16: Perceptions of individuals about benefits of the basin

Profile of individual users	N	Productive benefits	Regulatory benefits	Religious benefits	Educational benefits
Sex					
Male	108	2.71	2.41	2.62	2.20
Female	134	2.80	2.55	2.65	2.40
		<i>P</i> = .047	<i>P</i> = .092	<i>P</i> = .716	<i>P</i> = .011
Age					
<20	103	2.75	2.50*	2.72*	2.22*
20-24	73	2.79	2.64*	2.57	2.47*
25-29	52	2.74	1.95*	2.57	2.33
30+	14	2.91	2.15	2.13*	2.40
		<i>P</i> = .562	<i>P</i> = .000	<i>P</i> = .014	<i>P</i> = .034
Marital status					
Single	146	2.76	2.52	2.65	2.33
Married	96	2.89	1.95	2.33	2.00
		<i>P</i> = .328	<i>P</i> = .014	<i>P</i> = .131	<i>P</i> = .129
Occupational groups					
Sand miners	43	2.12	2.10	2.54	2.32
Farmers	78	2.68	2.52	2.68	2.30
Fisher folks	66	2.77	2.46	2.66	2.15*
Mineral miners	55	2.81	2.50	2.61	2.40*
		<i>P</i> = .059	<i>P</i> = .881	<i>P</i> = .672	<i>P</i> = .053

Scale: 1-1.49=strongly disagree, 1.50-2.49=agree, 2.50-3=strongly agree

*Significant difference ($p \leq 0.05$)

Source: Field data (2016)

The submissions of the heads of the management institutions and the users clearly show that the individual users had different perceptions about the benefits and the sustainability of the resources in the Lower Ankobra River Basin. The deferring perceptions (about the benefits of the basin), to some extent, explain the different behaviors and practices that were used by the

individual users of the basin. For example, while the majority of the female users (about 78 percent of them) supported the construction of structures to control erosion, about the same percentage (75.5) of the males caused the destructions of the basin's resources. In sum, the submissions of the heads of the management institutions, and the users indicate that the local management institutions failed to work with the management principles of accountability, equity and efficiency that have since 1997 been endorsed for effective distribution of social resources by the UNDP and the SHD (1997).

Summary

The chapter has described how local management institutions started with the bottom-up approach, and neglected the monitoring and evaluation duties in the approach. Without the monitoring and evaluation exercises, the entire management system became weak, and that gave miners the opportunity to over-extract mineral resources in the basin. On the implementation of policies, the chapter has shown that local management institutions disclosed new management policies through the media and by the District Assemblies in the basin. In spite of the above, 80% of the respondents claimed that they did not know of the policies that were formulated, and hence took advantage of that, and over-extracted the resources of the basin.

Finally, the chapter has showed that when local management institutions failed to follow the right principles such as equity, accountability and efficiency while distributing resources misallocation, and uneven distributions (of resources) ensued.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents the summary of the key findings; it draws the conclusions based on the findings, and makes recommendations to promote effective distribution of resources in the Lower Ankobra River Basin and elsewhere.

Summary

The Lower Ankobra River Basin is well endowed with several natural resources which are not shared equitably by the various user groups (WRC, 2000). The uneven sharing of the resources has therefore called for a better management approach. In the search for the approach, the local institutions started with the use of traditional methods based on customary laws and indigenous knowledge. These approaches failed. Thereafter, the problems of the local management institutions increased when other approaches such as the integrated and sectoral were adopted (Amakye, 2012). Failure of the institutions to equally share the resources in the Lower Ankobra River Basin raised a number of critical questions concerning the dynamism of the structures of the management system. The main objective of the present study was, therefore, to examine the institutional dynamics for managing resources in the Lower Ankobra River Basin.

Specifically, the study sought to:

- Assess the capacity of all the institutions responsible for managing the Lower Ankobra River Basin,

- Examine the functionality of the dynamic networks that exist among the institutions responsible for managing the Lower Ankobra River Basin,
- Evaluate the current management approaches or principles for sharing the resources in the Lower Ankobra River Basin to users, and
- Recommend sound approaches or principles to the institutions responsible for managing the resources in the basin.

Using a sample of 268 respondents comprising 242 users, eight community chiefs, 10 management institutions, and eight user institutions, data was obtained using both quantitative and qualitative methods. The quantitative data was analysed using the Statistical Product for Service Solution (version 16) software, and the results were presented in percentages, tables and diagrams. The qualitative data was analysed manually in the field.

Key findings of the study

The key findings of the study were as follows:

- The management institutions performed poorly due to several problems relating to the capacity for operation. With respect to financial and technical capacities of the management institutions, only one non-governmental organisation popularly called 'Yen Poano' was better resourced financially by International Water Resource Development Agencies such as the USAID and the World Fish Environment Sustainance. The other state management institutions (at the lower level) were seriously handicapped in terms of funds, personnel and the logistics needed for operation. As a result, enforcement of by-laws, monitoring and evaluation of projects by local

management institutions were saddled with challenges. Even though the three top institutions had internally-generated funds that helped them to achieve some of their objectives, these achievements remained at the top level of management – did not reach the first-line or local level of management that rather needed much financial resources. The challenge of financial inadequacy at the local level prevented all the institutions (both at the local or top management level) from achieving ultimate goal of conserving the basin's resources.

- An assessment of the functionality of linkages among the three top management institutions (the WRC, the NDPC and the MWH) showed poor level of collaboration. This happened because while the MWH collaborated with the WRC to formulate a number of policies on the exploitation of the basin, the NDPC failed to coordinate projects executed by the users of the basin. The situation of weak functional linkages gave way to the haphazard developments of projects, which the three institutions failed to team up, and control.
- The functional levels of cooperation among the local management institutions were, to a large extent, poor because the institutions used simultaneously, different approaches to manage the resources of the basin. The use of such multiple approaches diffused the functions and roles of the institutions. The level of coordination between traditional authorities such as chiefs and management organisations (EPA, FC, WRC and YP) were also poor because of the legal mandate problems. Individual users, particularly the miners, cooperated poorly with local management institutions because they felt many of the policies

formulated were against them (the individual users). In sum, all the parties that were expected to work as a team, especially those at the lower levels of management coordinated poorly, and that led to the weak functional linkages among them.

- The involvement of individual users in the management process was only up to the decision-making stage; individual users were engaged fully in decision making on policy formulation and project-design, but were not involved in the policy implementation and project building stages because of the destructive ways they exploited the resources of the basin. At the monitoring, evaluation and re-diversification of projects stages, the local people – individual users and members from the three District Assemblies in the basin – did virtually nothing to support the management institutions. Consequently, the local management institutions were reluctant to enforce management by-laws that protected the resources.
- The WRC assumed that the state management institutions worked using the principle of accountability, when they disclosed transparent documents about their work to the local users. It (the WRC) therefore did not consult the local users for further information on how or what the local institutions did to ensure accountability – to show how they utilise the resources provided by government. The practice, though persisted for some time, it was not corrected by the WRC; neither did it demand accountability from the local management institutions.
- An evaluation of the use of the principle of equity for sharing of resources in the basin revealed significant disproportions in the output

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obtained by the users. The quantity of water, fish and farm products obtained were generally low. That eventually caused a drop in the incomes of the farmers and the fisher-folks. At the same time, the sand winners and miners had greater opportunity to extract much of the resources in the basin; they therefore increased their incomes at the expense of the other users. The major factor which was responsible for the disparity in output and in incomes was the improper formulation and implementation of policies regarding resource extraction from the basin.

- The submissions by the heads of the management institutions, and the users, showed that the local management institutions did not perform their duties as directed by the efficiency management principles because they (the heads of the management institutions), to a large extent, did not know the strategies that they had to put in place to become efficient, or maximise benefits for those who were working in the basin.

Recommendations

The following recommendations are made based on the key findings of the study:

- First, to enable the institutions in charge of the management of the Lower Ankobra River Basin to work effectively, their financial and technical capacities should be improved. Government subventions (funds) should be available, as and when the institutions expect them, so that budgeting and planning can be made easy. Also, the three District Assemblies (Wassa Amenfi, Wassa West, and Nzema East) in

the basin must be adequately resourced, and be tasked by government to mobilise funds at social gatherings such as churches, durbars and festivals, and from communities in and around the basin, to support the local management institutions. The District Assemblies must be given specific monitoring duties different from those that have been given to the local management institutions, to prevent overlaps in *role-play* or conflicting duties that lead to shirking of responsibilities.

- It will be helpful if state management institutions in the basin team up with the NGOs, to facilitate transfer of new ideas and experiences that will improve service delivery. Such ideas will materialise, if the state institutions are well resourced in terms of logistics and funds.
- The mandate of drainage basin management institutions, supported by the *Water Resource Management Act 522 of 1996*, though has been stated clearly in the customary land administrative policy document; it is not known to many chiefs and other traditional leaders of the settlements in the basin. It should be the policy of government to instruct the local authorities to constantly support the operations of the management institutions in the basin. When this is done, the problems of legal pluralism that exist among the stakeholders in the basin would be resolved.
- To attract full participation of the communities surrounding the Lower Ankobra River Basin, first, they (the communities) will have to be educated by the management institutions, through workshops, seminars, and during social gatherings, on the implications of drainage basin management. The management institutions must also endeavour

to assist communities to get jobs and some essential social amenities such as roads, hospitals and schools. These will motivate members of the communities to support important stages such as monitoring of project developments.

- Finally, heads of local institutions must be instructed by the WRC, to work with management principles such as accountability, equity and efficiency that have been observed by the UNDP and the SHD (1997) to support fair distribution of social resources. To ensure accountability, the management institutions must, periodically provide accurate, accessible and comprehensible information on how resources have been used, by using community notice boards, and at social gatherings to the users of the basin. To promote equity, government of Ghana must first compensate, and reclaim all the lands in the basin from individuals using the powers enshrined in Section 12 and 13 of the Water Management Act, Act 522. After government has taken over the land, it should then re-allocate them (in smaller quantities) to the users whose economic activities will impact positively on the development of the basin. Finally, to increase efficiency in management, a single autonomous management body should be supervised by a higher authority, probably by a government monitoring team that will ensure that equipments, logistics and human resources are efficiently used to regulate activities of the users in the basin.

Conclusions

The review of the studies on drainage basin management has shown a number of institutional approaches that have been followed by both developed

and developing countries all over the world (see Chapter Three, Empirical Review Section). Prominent among those that failed many developing countries are the bottom-up, the top-down, the sectoral, and the integrated approaches (Blackburn & Holland, 1998; Darghouth, 2008; Meadows, 2003). Other notable management approaches that brought remarkable results to certain countries include: (a) Plummer and Slaymaker's (2007) Ethical Management Approach that was used by countries such as Bolivia, Brazil, Argentina and Peru in South America; (b) the World Bank's (2009) Accountable Management Approach that was adopted by South Korea, Pakistan and India in Asia; and, (c) the UNDP and the (GWA)'s (2006) Gender Mainstreaming Approach, and Plummer and Slaymaker's Public-private Partnership Approach which were adopted by many African countries for drainage basin management (see Chapter Three, Empirical Review Section).

In the case of Ghana, the approaches that came into the limelight, and were used for drainage basin management are: (i) the WRC (2000)'s Indigenous-Knowledge Approach; (ii) Opoku-Agyemang (2001)'s Customary Law Approach; (iii) Odame-Ababio (2010)'s Collaborative Management Approach; and, (iv) Mireku (2014)'s Multiple Management Approach (Chapter Three, Empirical Review Section).

The results from the use of the aforementioned drainage-basin management approaches were undesirable. In most cases, the results were uneven distribution, as well as poor or low community participation in management that finally caused rapid depletion of drainage basin resources.

One of such river basins that are still undergoing fast depletion is the Lower Ankobra River Basin in the Western Region of Ghana (WRC, 2000).

The attempts to save the Lower Ankobra River Basin from degradation have failed because of the weak functional networks among the stakeholders in charge of management as a result of the serious financial, technical and legal challenges, especially of state-owned management institutions. Though the NGOs had average quantity of resources to reverse the situation, they were given limited opportunities by the co-management institutions. The weak capacities of the institutions in charge of the management of the Lower Ankobra River Basin ultimately caused unequal sharing of resources among its users.

To share the resources in the basin equally, recommendations have been made to the institutions in charge of the management of the Lower Ankobra River Basin; they have been advised to work with three main principles that are accountability, equity and efficiency, which have been observed by the UNDP and the SHD (1997) to support fair distribution of social resources. To effectively work with these principles, requires the establishment of an autonomous body (institution) that should be empowered to distribute the resources in the basin to all users. Equitable sharing of the basin's resources is the desire of government *who* wish to maximise satisfaction, promote conservation, and reduce competition among the users of the basin. To solidify the management systems for equitable sharing of the resources in the Lower Ankobra River Basin, the responsible institutions must follow the philosophical guidelines of the *egalitarian* society.

The philosophy of the *egalitarian* society are built on the ideological precepts of the *utilitarians* who believe that “something is morally right if it helps the majority of people to obtain maximum satisfaction” (Kumah, 2009). This is to say that, if the local institutions will be able to increase efficiency in resource usage as requested by the egalitarian society, they must endeavour to utilise all resources (provided by government and those in the basin) to benefit all the parties concerned. After efficiency has been ensured, accountability must be promoted; this requires the management institutions to provide periodic, accurate, accessible and comprehensible information on how resources are used at every stage of management to all stakeholders.

With the above steps put in place, government of Ghana will be able to protect, and to restore the terrestrial and aquatic ecosystems of river basins in the country, to meet Target Six of the Sustainable Development Goal (SDG) Six.

Contributions to knowledge and literature, and implications for practice

This study adds to the growing literature on the approaches to the management and development of drainage basin resources worldwide. After a critical cross-examination of these approaches which include Plummer and Slaymaker’s (2007) Ethical Management Approach, the World Bank’s (2009) Accountable Management Approach, the UNDP and the (GWA)’s (2006) Gender Mainstreaming Approach, and Plummer and Slaymaker’s (2007) Public-Private Partnership Approach, the study contributes to the plethora of knowledge in the following ways:

The first significant contribution of this work is the development of the framework for assessing functional linkages that should exist between top and

lower-ranked social institutions. A number of studies that have already been considered only concentrated on models that assessed horizontal or lateral linkages among management institutions. This study has developed a framework (the IDBG-framework, Figure 3) that pays special attention to an important linkage (link WC-MI; consultations-supervision link) that should connect top management institutions to the local-level to enhance a vertical coordination. The establishment of strong vertical relationships was identified from the findings of the study to support supervisory roles of top management institutions; it also opens the way for lower-ranked institutions to consult higher ones for directives.

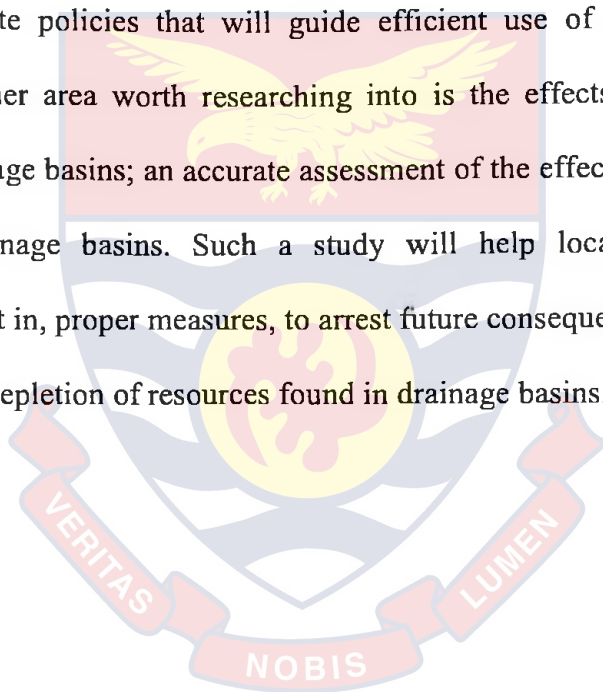
While the earlier works on drainage basin management focused on financial support such as management funds and salaries as the only factors which influenced workers to improve productivity, this work has gone further to discover bribery to be a relatively stronger satisfier which workers involved in the management of the Lower Ankobra River Basin regarded as a better motivator to work. The early identification of such motivators may be helpful to guide institutions to block inlets or channels that open management systems to bribery and corruption.

Finally, the findings of the study have brought to bear a social problem called clientelism that is undesirable political interferences that adversely affect the successful management of the Lower Ankobra River Basin. It has been observed that the problem of clientelism weakens legal capacities of the institutions. It also complicates the implementation of resource management by-laws. This study is the first to reveal a tactic – the establishment of a strong

legal task force using community members – to deal with the problem of clientelism.

Areas for further research

The findings and the conclusions of this study may differ from one region to another because of the differences in demographic characteristics of communities in different river basins. For this reason, it will be necessary for the research to be replicated in other regions where drainage basin resources are a major means of livelihoods. The findings of such researches can then be used to formulate policies that will guide efficient use of drainage basin resources. Another area worth researching into is the effects of land-cover changes in drainage basins; an accurate assessment of the effects of land cover changes in drainage basins. Such a study will help local management institutions to put in, proper measures, to arrest future consequences that might occur from fast depletion of resources found in drainage basins.



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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

COLLEGE OF HUMANITIES AND LEGAL STUDIES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

**IN-DEPTH INTERVIEW GUIDE FOR OPINION LEADERS IN THE
STUDY COMMUNITIES**

Date of interview Place of interview; Interviewer
Interviewee gender; Time of interview; Name of institution
Position/title of head

The main objective of the study is to investigate the institutional dynamics for managing the Lower Ankobra River Basin, and it is in connection with a Doctoral thesis project that is being pursued as part of the requirements for award of a degree. The study is primary for academic work, and therefore you are assured of full confidentiality, privacy and anonymity of all the information that you will give. Please or kindly answer each question to the best of your ability by providing responses that best reflect your opinion.

Section A: Background information

1. Name of community
2. Sex
3. What is your level of education?
4. Occupation
5. What is your religion?
6. What is your marital status?
7. How long have you been living in this community?

Section B: Drainage basin institutional management approach

Which of the following management approaches have been adopted?

- a. *Bottom-up* b. *Top-down* c. *Sectoral* d. *Integrated*

If (a) go to bottom up, if (b) go to top-down, if (c) go to sectoral or if (d) go to integrated

8. Does the government involve you in managing the drainage basin?

If Yes/No (in either situation probe)

- a. **Probe:** for where involvement is done; in decision making, formulation of management policies, implementation of project policies or monitoring and evaluation.

9. Mention some projects initiated in your community towards the management of the drainage basin

10. Probe: Nature of the project(s) (e.g. terracing, tree planting etc), when the projects were started, which organisation initiated the projects, challenges encountered in starting projects, successes in each project. Are the projects done jointly by the organisations or, jointly by NGOs and state management organisations?

11. Do the organisations have different management activities (use the sectoral approach)? If Yes/No (in either situation probe)

- b. **Probe:** type of activities (e.g. contour-bunding, landslide, gully control, plantation growing, etc.), times that the departments do such activities, aspects of the drainage basin (e.g. forest, land or water) that the activities are aimed at, challenges encountered in this approach, advantage of this approach.

12. How would you rank the success of the **top-down approach** process of drainage basin management: (Very high, High, low or Very low).

c. **Probe** for choice of answer and in each case enquire what prevents or promotes success (e.g. lack of community participation, irregular flow of information, irregular flow of funds, delay in decision making etc.)

13. What is the main advantage in using the top-down approach;

d. **Probe** ;(e.g. quick decision making, reliance on expert ideas from the top, etc.)

14. How would you rank the success of the **bottom-up approach** of drainage basin management: (Very high, High, low or Very low).

e. **Probe**; reasons for choice of answer and in each case enquire what prevents or promotes success (e.g. problems with the use of drainage basin as a common resource, irregular flow of information, flow of funds, delay in decision-making, etc.).

15. What is the main advantage in using the **bottom-up approach**?

f. **Probe** (e.g. arresting free-rider behaviour, mobilising the needed financial resources and labour resources from communities, imposing self-devised sanctions on individual members for resource degradation.)

16. Does the District Assembly play any role in drainage basin management? If yes, what role does it play?

g. **Probe**; revenue mobilisation, enforcement of laws, organisation of community support through communal labour,

serving as a medium of the transfer of management laws, policies and regular measures from the top, as practice in the top-down approach.

Section C: Institutional Challenges in the management of the drainage basin

Challenges relating to the legal framework

17. Are there traditional laws instituted to protect the drainage basin?

Probe; who formulate such laws, who implements the laws, how are the laws implemented, do the laws receive the support of the traditional leaders, and are the laws obeyed by the local people. If No, why do they not obey the laws, give reasons in each case?

18. Are the traditional laws supported by the state authority?

Probe If No, why does the state not support the traditional authority? Give reasons and suggest possible elements that bring problems in harmonisation authority

Challenge relating to organisational/institutional capacity

19. What is the capacity of the organisations here to resolve trans-boundary conflicts between communities? **Probe;** what is the method used in resolving conflicts (e.g. arbitration, mediation, community conferencing etc.)

Section D; effects of the management system on the benefits derived from the basin

(i) Production benefits

20. Has management activities improved or destroyed the community members' access to land for cultivation. How, since when, what specific activity causes that, how has it affected your income?
21. Has management activities improved or destroyed the water resources that support irrigation activities? Probe; how, since when, what specific activity causes that, how has it affected your crop yield or income?
22. Has the management activity improved or declined the timber resources fetched from the forest? Probe; since when, what specific activity causes that, how has it affected your income?
23. Has the management activity improved or destroyed the quantity of sand obtained? How, since when, what specific activity causes that, how does it affect your income?

(ii) social benefits (recreational or educational or religious or regulatory)

24. Has the network or connection (conflicts, access to usage, negotiations and other social networks) among neighbouring communities improved or been destroyed. Probe; how, since when, what causes that, how does it affect your income?
25. Are the common rules and traditional laws obeyed by all the surrounding communities affected by the management of the drainage basin?

26. Has management activities affected community or collaborative activity or participation (such as decision making, community labour, conflict resolution). Probe; how, since when, what management activity causes that.



APPENDIX B

UNIVERSITY OF CAPE COAST

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING, IN-DEPTH INTERVIEW GUIDES FOR HEADS OF DRAINAGE BASIN MANAGEMENT INSTITUTIONS

Date of interview Place of interview; Interviewer name;
Interviewee gender; Time of interview; Name of institution
Position/title of head

The main objective of the study is to investigate the institutional dynamics for managing the Lower Ankobra River Basin and it is in connection with a Doctoral thesis project that is being pursued as part of the requirements for award of a degree. You are assured of full confidentiality, privacy and anonymity of all the information that you will give. Please kindly answer each question to the best of your ability by providing responses that best reflect your opinion.

Section A: Background information

1. Name of community
2. Position/Status of head
3. Sex of head
4. Level of education of head
5. Occupation of head
6. Religion
7. Marital status
8. How long have you been working in this organisation?

Section B: linkages among the organisations.

9. What roles do your organisation play in relation to the management of the drainage basin?
10. What is the relationship (linkage) between your organisation and
- Other public (e.g Forestry Commission, EPA) drainage basin managers (organisations) **probe**; what sustains the relations, what are the challenges in keeping such relationships.
 - Drainage basin user-organisations (e.g. IDA, CWGL) **probe**; what sustains the relations, what are the challenges in keeping such relationships.
 - Non-governmental organisations into management (e.g. Coastal Resource Centre, Ghana (CRC-Ghana) **probe**; what sustains the relations, what are the challenges in keeping such relationships.
11. What is the relationship (linkage) between your organisation and
- (i) National Development Planning Commission (NDPC) **probe**; what sustains the relations, what are the challenges in keeping such relationships.
 - (ii) Ministry of Works and Housing (MWH) **probe**; what sustains the relations, what are the challenges in keeping such relationships.
 - (iii) Water Resource Commission (WRC) **probe**; what sustains the relations, what are the challenges in keeping such relationships.

Section C: Drainage basin management approach

12. Do you involve the community in managing the drainage basin? If

Yes/ No (probe in either situation)

a. **Probe:** what stage is the community involved; in decision making, formulation of management policies, implementation of project policies, monitoring and evaluation.

13. Do you undertake management activities with other organisations (use the sectoral approach)? If Yes/ No (probe in either situation)

b. **Probe:** type of activities (e.g. contour-bunding, landslide, gully control, plantation growing, etc.), times that the departments do such activities, aspects of the drainage basin (e.g. forest, land or water) that the activities are aimed at, challenges encountered in this approach and advantage of this approach.

c. **Probe** for choice of answer and in each case enquire what prevents or promotes success (e.g. lack of community participation, irregular flow of information, irregular flow of funds, delay in decision making etc.)

14. What is the main advantage in practising top-down decision-making and implementation approach;

d. **Probe;** (e.g. quick in decision making, reliance on expert ideas from the top, etc.)

15. How would you rank the success of the **bottom-up approach** of drainage basin management: (Very high, High, low and very low).

e. **Probe** for choice of answer and in each case enquire what prevents or promotes success (e.g. problems with the use of

drainage basin as a common resource, irregular flow of information, flow of funds, delay in decision making etc.)

16. What is the main advantage in the **bottom-up approach**?

- f. **Probe** (e.g. arresting free-rider behaviour, mobilising the needed financial and labour resources from communities, imposing self-devised sanctions on individual members for resource degradation.)
- g. Rank the level of community support in the management of the drainage basin? Choose from these options (Very high, high, low and very low).

Challenges: Capacity of the organisation in managing drainage basin

Financial capacity

17. What are your sources of funds for the management of the drainage basin?

- o **Probe**; (e.g. state, district assembly mobilised funds, donor or NGOs support, polluter-pay fee and fines, etc.), rank reliability of the sources in cases where there more than one source. Comment on the adequacy of the funds from these sources? What other assistance do you receive from NGOs or the state? Probe; (in terms of advice, technical, education and training. etc.)

Technical capacity

18. How many workers do you have in your organisation? **Probe;** Explain the processes involved in the recruitment of workers. Is the process of recruitment in your company influenced by government interference or government appointment? If yes /No (probe in either situation) explain the outcome of such influences. Comment on the general competency of workers employed in this organisation, irrespective of how they have been selected.
19. How often do you organise refresher courses, workshops or seminars organised for your employees? If Yes/No (probe in either situation), who organises it and who bears the cost involved?
20. Does your organisation have the following ;
- Equipment: **probe;** quantity or adequacy in terms of the available work to do, kind supplied, who supplies them, how often are they supplied, is there any mandate on its usage/maintenance?
 - Vehicles: **probe;** quantity or adequacy in terms of the available work to do, which kinds, who supplies them, how often are they supplied ?, is there any mandate on its usage/maintenance?

Challenges relating to Legal mandate

21. Are there traditional laws instituted to protect the drainage basin?
- **Probe;** who formulate such laws, who implements the laws, how are the laws implemented, do the laws receive the support of the traditional leaders, and are the laws obeyed by the local people? If No, why do they not obey the laws, give reasons in each case?

22. Do the traditional laws support or conflict your authority?

- **Probe** If No, why? Give reasons and suggest possible elements that bring problems in harmonisation mandate.

23. Any other observation or comment you wish to give ?

*Thank You for your
attention and participation*



APPENDIX C

UNIVERSITY OF CAPE COAST

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING,
IN- DEPTH INTERVIEW GUIDE FOR HEADS OF DRAINAGE BASIN

USER - INSTITUTIONS

Date of interview Place of interview; Interviewer

Interviewee gender; Time of interview; Name of institution

Position/title of head

The main objective of the study is to investigate the institutional dynamics for managing the Lower Ankobra River Basin, and it is in connection with a Doctoral thesis as part of the requirements for award of a degree. You are assured of full confidentiality, privacy and anonymity of all the information that you will give. Please or kindly answer each question to the best of your ability by providing responses that best reflect your opinion.

Section A: Background information

1. Name of community
2. Position/Status of head
3. Sex of head
4. Level of education of head
5. Religion of head
6. How long you have you been working in this community?

Section B: Institutional linkages in drainage basin management

What activities do you undertake on the drainage basin?

7. In your opinion, does your activity affect the drainage basin? **Probe;** which effect (positive or negative) and which aspect of the drainage basin is affected

8. What is the relationship (linkage) between your organisation and;

○ Other public drainage basin managers (organisations). **Probe:** what sustains the relations, what are the challenges in keeping such relationships?

○ Drainage basin users (organisations). **Probe:** what sustains the relations, what are the challenges in keeping such relationships?

○ Non-governmental organisations into management (e.g. Integrated Coastal Fisheries and Governance Institute, ICFGI). **Probe:** what sustains the relations, what are the challenges in keeping such relationships?

9. What is the relationship (linkage) between your organisation and

(i) National Development Planning Commission (NDPC) **Probe:** what sustains the relations, what are the challenges in keeping such relationships?

(ii) Ministry of Works and Housing (MWH) **probe:** what sustains the relations, what are the challenges in keeping such relationships?

(iii) Water Resource Commission (WRC) **probe:** what sustains the relations, what are the challenges in keeping such relationships?

Organisational challenges in managing drainage basin

Financial capacity

10. What are your sources of funds for the management of the drainage basin?

○ **Probe;** (e.g. state, district assembly mobilised funds, donor support, polluter-pay fee and fines, etc.), rank reliability of the sources in cases where there are more than one source. Comment on the adequacy of the funds from these sources? What other assistance do you receive from

NGOs or the state? Probe; (in terms of advice, technical, education and training. etc.)

Technical capacity

11. How many workers do you have in your organisation? **Probe;** Explain the processes involved in the recruitment of workers, Is the process of recruitment in your company influenced by government interference or government appointment? If yes explain the outcome of such influences? Comment on the general competency of workers employed in this organisation, irrespective of how they have been selected.
12. How often do you organise refresher courses, workshops or seminars organised for your employees? If yes, who organises it and who bears the cost involved.
13. Does your organisation have the following ;
 - o Equipment: **probe;** quantity or adequacy in terms of the available work to do, kinds, who supply them, how often, are they supplied, is there any mandate on its usage?
 - o Vehicle: **probe;** quantity or adequacy in terms of the available work to do, which kinds, who supplies them, how often, are they supplied, is there any mandate on its usage?

Challenges relating to Legal mandate

14. Are there traditional laws instituted to protect the drainage basin?
 - o **Probe;** who formulate such laws, who implements the laws, how are the laws implemented, do the laws receive the support of the traditional leaders, and are the laws obeyed by the local people. If No, why do they not obey the laws, give reasons in each case?

15. Do the traditional laws support or conflict your authority?

- **Probe** If No, why? Give reasons and suggest possible elements that bring problems in harmonisation mandate.

16. Any other observation or comment you wish to give?

*Thank You for your
attention and participation*



APPENDIX D

UNIVERSITY OF CAPE COAST
COLLEGE OF HUMANITIES AND LEGAL STUDIES
DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING
SEMI-STRUCTURED INTERVIEWED GUIDE FOR INDIVIDUAL
USERS OF THE LOWER ANKOBRA BASIN

Dear Sir/Madam

The purpose of this study is to examine the institutional dynamics for managing the Lower Ankobra River Basin. This is in connection with a Doctoral research being carried out as part of the requirements for award of a degree. I would be most grateful if you can complete this semi-structured interview guide. This research is purely for academic purposes. You are assured of the strictest confidentiality and anonymity. Thank you for agreeing to participate.

Mireku Okoree Dickson (PhD student)

Please answer the following questions and tick where appropriate.

Socio-demographic characteristics

1. Age: [in completed years]
2. Sex: a. Male b. Female
3. Level of educational: a. Primary b. Secondary
c. Tertiary (non-degrees) d. Tertiary (degree)
e. Other specify.....
4. Marital status: a. Single b. Co-habitation
c. Married d. Separated e. Divorced
f. Widowed
5. Religion.....
6. Position/rank.....
7. No of years position is held
8. Duty or roles required of you:
9. No of years of work

Section I: Evaluating the use of management principles

a. Evaluating Transparency

Please indicate your level of agreement or disagreement with the following statements by ticking the appropriate box if your answer to the statement is “yes”. 0 = strongly disagree, 1= disagree, 2= neither agree nor disagree, 3= agree, 4= strongly agree.

Issue	None → High				
	0	1	2	3	4
10. The local institutions are opened in terms of their operations; decision making and implementation of policies					
11. The local institutions make official information accessible in prints					
12. The local institutions broadcast information about management on radio and TV					
13. The local institutions evaluate with the communities the quality and quantity of services provided					
14. The local institutions give relevant information prior to decision-making with the local people					
15. The local institutions disclose information timely, accurate and understandable information on community notice boards					

b. Evaluating Accountability

16. Are there modes of accountability that can make basin management institutions answerable for their actions? a. Yes [] b. No []
If no what is the reason?

© University of Cape Coast <https://ir.ucc.edu.gh/xmlui>
 If yes indicate the stages where accountability is done and tick level of strictness by the local management institutions on your economic activity with regards to each of the following issues

Issue	None →				
	High				
	0	1	2	3	4
a) Local institutions show budgets on projects to individual users					
b) Local institutions present reports frequently on how funds have been used					
c) Local institutions show problems diagnosed and explain plans for re-diversification					
d) Local institutions present frequent reports on how funds have been used to local individuals					

c. Evaluating Participation

1. Are the local people given the opportunity to participate in the management of the drainage basin
 a. Yes [] b. No []

If yes rate the process in which the communities are involved in

Issue	None →				
	High				
	0	1	2	3	4
a) decision making, monitoring and evaluation					
b) Local institutions prepare budgets on projects to be undertaken with individual users					
c) Local institutions prepare reports frequently on how funds have been used					
d) Local institutions diagnose problems with individual users and decide future management plans					

Do the local institutions handle issues of legitimate authority or mandate for managing the resources in the basin appropriately ? a. Yes [] b. No []

If no what is the reason?

Please indicate your level of agreement or disagreement with the following statements by ticking the appropriate box if your answer to the statement is “yes”. 0 = strongly disagree, 1= disagree, 2= neither agree nor disagree, 3= agree, 4= strongly agree.

Issue	None → High				
	0	1	2	3	4
a) The management institutions have power to regulate the use of resources in the basin					
b) Local institutions shared mandate for management with the local people					
c) Local institutions frequently informed local users on consolidation(amendments) made in laws for management					
d) Local institutions management institutions stick to the rules for executing punishment on illegal users of the basin resources					

e. Evaluating ethical principle

2. Which of the following uses have the management institutions permitted in the basin

Please indicate your level of agreement or disagreement with the following statements by ticking the appropriate box if your answer to the statement is “yes”. 0 = strongly disagree, 1= disagree, 2= neither agree nor disagree, 3= agree, 4= strongly agree.

Issue	None → High				
	0	1	2	3	4
a) religious uses					
b) recreational					
c) educational					
d) aesthetic and tourism					

3. Which projects and aspects of the drainage basin that these activities have taken place?
- a) religious uses/users aspect
 - b) recreational/users aspect.....
 - c) educational/users aspect.....
 - d) aesthetic and tourism//users aspect.....

f. Evaluating principle of equity and fairness

Please indicate your level of agreement or disagreement with the following statements by ticking the appropriate box if your answer to the statement is “yes”. 0 = strongly disagree, 1= disagree, 2= neither agree nor disagree, 3= agree, 4= strongly agree.

4. *Indicate your level of agreement with the following products or 'economic benefits' derived from the basin*

Statement	None → High				
	0	1	2	3	4
a) I get foodstuffs from the basin					
b) I get fish from the basin					
c) I get fuel wood from the basin					
d) I get sand from the basin					
e) I get mineral resources					

5. *Indicate your level of agreement with the following 'regulatory services' derived from the basin*

Statement	None → High				
	0	1	2	3	4
a) The basin prevents erosion in my working environment or surroundings					
b) The basin resources (trees) regulate pollutants in my surroundings					
c) The basin purifies the rivers for domestic activities					
d) The basin protects my building from strong winds					

6. Indicate your level of agreement with the following religious or spiritual benefits derived from the basin

Statement	None →				
	High				
	0	1	2	3	4
a) I use some portions of the basin for daily worship					
b) Portions of the basin are used for church programmes (crusades, picnics etc.)					
c) I derive inspiration from the trees, rivers and other forest products					

7. Indicate your level of agreement with the following educational benefits derived from the basin

Statement	None →				
	High				
	0	1	2	3	4
a) I use the basin resources (e.g vegetation) to study the changes in the weather conditions					
b) I learn from natural resources in the basin					
c) I use the basin resources to teach others					

8. Indicate your level of agreement with the following recreational benefits derived from the basin

Statement	None →				
	High				
	0	1	2	3	4
a) I learn cultural values from tourists who visit interesting sites of the basin					
b) I get interest from games organised in the basin					
c) I enjoy the aesthetic beauty of the basin					

APPENDIX E

Drainage basin management policies formulated by the MWH

Date formulated	Policies formulated	Goals to be achieved
1996	Integrated Water Resource Management Policy (IWRMP)	To promote sound cooperation among water resource users and managers
2001	Water Use Regulation LI 1962 Policy	To streamline the administration and governance over local water bodies
2006	Drilling for Water and Groundwater Development Regulation Policy LI 1827	To license drilling companies and ensure safe development of drainage basin resources.
2007	The National Water Vision Policy	Being consolidated with other key water sector policies to comprehensively manage the nation's water resources.
2012	The National Buffer Zone Policy	To prohibit the development of programmes to safeguard watershed or basin resource.

Source: Ghana Ministry of Works and Housing, 2010

APPENDIX F

Projects implemented by MoFA from 2010 to 2015

Projects	Date of implementation	Expected role of CWSA	Expected role of GWCL	Expected role of IDA
Soil Fertility Project	2010	Monitor the activities of upstream users of R. Ankobra	Rehabilitate dam to prevent erosion and flooding	Educating farmers on the crop residue method
The Contour Farming Project	2011	Educate farmers on how to prevent run-offs on hill slopes	Assist in monitoring and evaluation	Provide ploughs for planting
The Vegetative Barrier and Earth Bunds Project	2012	Educating farmers on soil conservation on sloppy farmlands	Educating farmers on grass barrier or ling method of cultivation	Teaching farmers on how to use the earth bunds in cultivation
Smallholder Rehabilitation Project	2015	Teaching communities innovative systems of tapping water for domestic uses	Assist in monitoring and evaluation	Provide pumps for the communities to derive alternative sources of water during dam rehabilitation period

Source: Ministry of Food and Agriculture. Accra, Ghana, 2015

APPENDIX G

Procedures to acquire Water Use Permit in Ghana

Under the Water Management Act, Act 522 of the Republic of Ghana, before the Water Use Permits are issued out, the proponent must duly go through the following processes;

- e. apply by writing letters to all the local management institutions for inspection and approval of the proposed project site,
- f. wait for three months to get feedback from the local management institutions when approval is given by the WRC,
- g. organise a public hearing by inviting all the important stakeholders such as the Town and Country Planning Department, Lands Commission, Survey Department and sometimes, the Hydrological Service Department to discuss the potential benefits and threats of the proposed project,
- h. apply to the for the permit from the WRC through the local drainage management institutions after the public hearing and,
- i. serve the local people who can be affected by the proposed project with notices of the Water Use Permit

After following all the above processes then the WRC will issue a Water Use Permit to the proponent to commence business.



APPENDIX H
Raosoft's (2004) Sample Size Determination Table

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	375
50	44	180	123	420	201	1400	306	8000	373
55	48	190	127	440	205	1500	306	9000	268
60	52	200	132	460	210	1600	310	10000	373
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	10000	384

*N is the population size
Alpha level (α) = 5%,
Source: Adopted from Raosoft (2004)

*S is sample size
R=50% response rate

CURRICULUM VITAE
DICKSON OKOREE MIREKU
Master of Philosophy [Geography]
PhD [Geography and Regional Planning]
P.O. Box 203,
Cape-Coast,
Central Region.
Tel: 020-7420413
Email: dicksonmireku68@gmail.com

OBJECTIVE

Seeking a sponsorship support to complete my research in the field of Resource Management in your school to enable me to complete my research work on time.

EDUCATION

University Of Cape Coast (2010-2013)
Master of Philosophy (Geography)
Some courses read: **Rural Resource Management I & II**, Geographic Thought I & II, Geographic Information System, Research Methods, Quantitative Statistical Analysis, Theory and Practice of Regional Planning, etc

University Of Cape Coast (2000-2004)
Bachelor of Arts (Geography & Economics)
Some courses read: Elements of Physical Geography, Surveying I & II, Climatology and Pedology, Geographic Information System, Research Methods, Mathematical Economics, Econometrics I & II, Public Sector Economics, Elements of Microeconomics and Macro- economics, etc

St. Peters Secondary School (1996-1998)
Senior Secondary School Certificate
Some subjects read: Geography, Economics and Further Mathematics

Basic Education
Nkwatia Presby Junior Secondary School (1993-1995)
Basic Education Certificate Examination

WORK EXPERIENCE

Holy Child High School

Tutor in Economics, Geography and Social Studies (September, 2006 – date)

- Researching and teaching
- Setting of examination questions and marking of scripts
- Invigilating and moderating examinations

National Service

Centre for Development Studies [now Institute of Development Studies (IDS)], University of Cape Coast (March, 2005- August, 2006)

- Mark scripts and invigilate examinations

- Perform academic counselling for students
- Organise presentation sections during workshops
- Present periodic reports on various researches organised by the department

**PUBLICATIONS
IN REFEREED
JOURNALS**

1. Mireku, O. D., Acheampong, P. K., Mariwah, S., & Atampugre, G. (2014). **Institutional arrangement for managing watersheds in Ghana: A study of the Inchaban Watershed.** *International Research Journal of Natural and Applied Sciences.* 1(3), 38-60.
2. Mireku, O. D., & Mariwah, S. (2014). **Approaches to watershed management in Ghana: A study of the Inchaban Watershed.** *International Journal of Multidisciplinary Research Academy.* 4(7), 75-105.
3. Agyemang, W., Amoako-Sakyi, R., Ojo, T. K., Mireku, O. D. (2014). **Gender Perspective of Campus Shuttle Services in Ghana.** *International Research Journal of Management and Commerce.* 1(6), 37-49.
4. Ojo, T. K., Mireku, O. D., Duada, S., & Nutsogbodo, R. Y. (2014). **Service quality and customer satisfaction of Public Transport on the Accra-Cape Coast route.** *International Knowledge Sharing Platform.* 1(6),45- 60.
5. Mireku, O. D. & A. K. Mensah (2015). **Policy intervention in watershed management: The case of the Inchaban Watershed, Ghana.** *International Journal of Water Resources and Environmental Engineering.* 7 (3), 38-49.
6. Mireku, O. D., P. K. Acheampong, S. Mariwah, K. Adu-Boahen, & A. K. Mensah (2015). **Institutionalising Community Participation in Watershed Management: A Study of the Inchaban Watershed in the Western Region of Ghana.** *International Journal of Scientific and Research Publications,* 5(5), 1-8.
7. Mensah, A. K., Mahiri, I. O., Owusu O., Mireku, O. D., Wireko, I. & Kiss, E. A. (2015). **Environmental Impacts of Mining: A Study of Mining Communities in Ghana.** *African Journal of Environmental Science and Technology* 3(3)81-94.
8. Mensah, A. K. & Mireku, O. D. (2015). **The Extent of Groundwater Use for Domestic and Irrigation Activities in**

Thiririka Sub-Catchment, Gatundu District, Kiambu County, Kenya. *African Journal of Environmental Science and Technology*, 4(3), 40-78.

**CONFERENCES,
WORKSHOPS
AND SEMINARS**

- Champions Conference: Making a difference in an indifferent world 17th - 18th May, 2014, held in Cape-Coast, Ghana.
- Champions Conference: Raising agents for change- 20th November, 2012, held in Accra. Ghana
- GES Workshop: Incorporating HIV/AIDS in teaching Geography and Economics. 5th - 7th August, 2010, held in Cape-Coast, Ghana.
- Academic Writing Workshop on Qualitative Research, 8 – 9th December, 2015. University of Cape-Coast, Ghana.

**A. EDITORIAL
ACTIVITIES**

Reviewer for a number of journals including International Journal of Natural and Applied Science (IJNAS), Scholedge International Journal of Management and Development (SIJMD)

SKILLS

Information Technology skills (Microsoft Word and Microsoft Excel), Good interpersonal skills, Innovative and ability to research and publish

INTERESTS

Reading, researching, counselling and teaching

**PERSONAL
PROFILE**

Date of Birth- 30th August, 1980.
Place of Birth- Asuboa, Ashanti-Akyem
Marital Status- Married with two children
Hometown- Nkwatia- Kwahu
Languages- Twi, Ga, Fante and English

REFEREES

Prof. Kwabena Berimah Antwi-Senior Lecturer
Department of Geography and Regional Planning
University Of Cape Coast, Tel no. 0246143986

Prof. P. K. Acheampong- Senior Lecturer
Department of Geography and Regional Planning
University Of Cape Coast, Tel no. 0208164018

Dr. Simon Mariwah-Head of Department
Department of Geography and Regional Planning
University Of Cape Coast