

UNIVERSITY FOR DEVELOPMENT STUDIES

SUSTAINABILITY OF COMMUNITY RESOURCE MANAGEMENT AREAS IN THE
BLACK VOLTA BASIN, UPPER WEST REGION

HARUNA ELIYASU



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BLACK VOLTA BASIN, UPPER WEST REGION

BY

HARUNA ELIYASU

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THESIS SUBMITTED TO THE DEPARTMENT OF ENVIRONMENT
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DECLARATION

I submit this work towards the partial fulfilment for the award of MPhil degree in Environment and Resources Management by the University for Development Studies (UDS), Wa Campus. I declare that this is my work and to the best of my knowledge it has not been submitted by anybody, person, or institution for the award of MPhil Degree. All due acknowledgements have been made to all sources consulted in the process of the study.

Signature.....

Haruna Eliyasu

Student

Date.....

I hereby declare that the preparation and presentation of the thesis were supervised under the guideline on supervision of dissertations or thesis laid down by the University for Development Studies (UDS) and that the laid down guidelines were strictly followed.

Signature.....

Dr Raymond Aabeyir

Supervisor

Date.....



ABSTRACT

The Community Resources Management Areas (CREMA) mechanism which is Ghana's version of the Community Based Natural Resources Management (CBNRM) concept was introduced in the country by the Wildlife Division of the Forestry Division to ensure sustainable conservation and natural resources management. Since then, over 40 CREMAs has been established in Ghana. Three of these CREMAs were established in the Black Volta Basin, north of the Bui National Park to ensure sustainable conservation of the hippopotami as a keystone species and other natural resources in those CREMAs. Several successes have been chalked by these CREMAs amidst several challenges. The sustainability of these CREMAs and others has however been questioned by critics and sceptics. This study assessed the extent to which the CREMA mechanism in Wechiau, Dorimon and the Zukpiri CREMAs has contributed to effective conservation and management of natural resources. The study used the mixed methods design in gathering data. The study used purposive, random, and expert sampling techniques. Field measurements, in-depth interviews and focus group discussion was used to source primary data, while secondary data were gathered through existing documents, reports, and internet search. The results revealed increases in the population of hippopotami as a keystone species from 2017 to 2019. A good population and diversity of birds were recorded with an average Simpson Diversity index of 0.98 for the three years of study. A diverse vegetation composition of the CREMAs which was observed and recorded contributed positively to the survival and continuous increase in the population of fauna. While the dominant economic species namely Shea and African Locust bean contributed to the sustenance of the CREMAs. Benefits accrued to the CREMAs ranged from ecotourism revenues, employment, Infrastructure development, educational opportunities, livelihoods, relationships, and conservation; however, these benefits are not equitably shared due to the absence of an elaborate benefit-sharing plan. Representation in the governance process is good as members of CREMA communities are represented in the governance process and they participate in decision making structures and activities. The study concludes that Wechiau CREMA, Zukpiri CREMA and to some extent the Dorimon CREMA has succeeded in meeting a majority of the requirements necessary to ensure sustainability. The study established that the diversity and abundance of Hippopotami, Birds, and vegetation of the three CREMAs have recorded positive changes and is on a sustainable trajectory with the introduction of the CREMA mechanism in the basin. Benefits such as revenues to the CREMAs, Employment for CREMA members, infrastructure and other opportunities has for the period of the study showed clear indications of sustainability. Governance and management structures of all three CREMA have been established and they are operational. The existing management structure of all CREMA was found to be effective in meeting the objectives of each CREMA as captured in the constitutions of those CREMAs. Though the level of achievement of these set of objectives varies for each CREMA, management generally showed enthusiasm at meeting them to ensure sustainability in all sectors. However, there are still several pressing issues that require attention and action from management to fully achieve sustainability. These include but are not limited to; - a strong belief in supernatural forces that lead to little effort towards conservation, - the negative effects of climate change, - poor leadership due to divergence in conservation and economic interest among others. The study recommends that hippopotami and other fauna be monitored simultaneously in all three CREMAs in a collaborative manner. CREMAs' capacity must be built on the development and implementation of benefit-sharing plans. The Black Volta Basin must also be seen as viable for multiple ecotourism activities and such potentials should be tapped. Furthermore, Ecotourism around the hippopotamus or other fauna and flora should be explored.



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DEDICATION

I dedicate this intellectual piece to my parents: Alhaji Zakaria Haruna and Hajia Aminata Osman and to the people of the three CREMAs of the Black Volta Basin, whose lives and sacrifices are of concern to me.



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LIST OF ACRONYMS

AEZ.....	Agro-Ecological Zone
AGM.....	Annual General Meeting
AgNRM.....	Agriculture and Natural Resource Management
CAMPFIRE.....	Communal Areas Management Programme for Indigenous Resources
CEC.....	CREMA Executive Committee
CO ₂	Carbon dioxide
CREMA.....	Community Resources Management Areas
CRMC.....	Community Resources Management Committee
DA.....	District Assembly
DBH.....	Diameter at Breast Height
EPA.....	Environmental Protection Agency
FAO.....	Food and Agriculture Organisation
FORIG.....	Forest Research Institute of Ghana
GEF.....	Global Environmental Facility
GTA.....	Ghana Tourism Authority
ITCZ.....	Inter-Tropical Convergence Zone
IUCN.....	International Union for Conservation of Nature
NCRC.....	Nature Conservation Research Center
NGO.....	Non-Governmental Organisation
NHT.....	National Heritage Trust
NREG.....	Natural Resource and Environmental Governance
NRM.....	Natural Resources Management



NT.....Near Threatened

NTFPs.....Non-Timber Forest Products

PRA.....Participatory Rapid Appraisal

SDI.....Simpson’s Diversity Index

SFC.....Savannah Fruits Company

SGP.....Small Grants Programme

UNDP.....United Nations Development Programme

USA.....United States of America

VSLA.....Village Savings and Loans

WCHS.....Wechiau Community Hippopotamus Sanctuary

WCMC.....World Conservation Monitoring Centre

WD.....Wildlife Division

WRC.....Water Resources Commission

WTO.....World Trade Organisation



APPENDICES

Appendix 1: Bird Survey Data Sheet

Appendix 2: Hippopotami Monitoring Datasheet

Appendix 3: Vegetation Sampling Sheet

Appendix 4: Questionnaire for Household heads

Appendix 5: Questionnaire for Staff and Management

Appendix 4: Key Informant Interview Guide



CHAPTER ONE

1.0 Introduction

1.1. Background

Globally, increasing human population and poverty have drastically accelerated the degradation of biodiversity as well as the depletion of natural resources for centuries (Ayoo, 2008). The serious deterioration of ecological systems continues to occur around the globe (Millennium Ecosystem Assessment, 2006). Natural products and services of these ecological systems that have sustainably supported many local indigenous economies for generations are at risk. This has contributed to increased poverty, relocation, and other serious disruptions of communities that were benefitting directly from these ecological systems. The deterioration of the natural ecological systems has also contributed to a disturbance in the climate systems through the emission of greenhouse gases such as carbon dioxide (CO₂) resulting from the destruction of forests. It is estimated that 18.3% of greenhouse gases generated is attributed to the current deforestation practices going on across the world (World Resources Institute, 2005). This situation requires enhanced coverage of protected areas globally, to effectively mitigate the increasing loss of the earth's biodiversity, specifically in species-rich tropical forests (Sheppard et al., 2010). Initial efforts in the last two centuries at curbing the increasing loss of biodiversity brought about the establishment of national parks across the world, a strategy that has a checkered history.

The history of conservation and natural resource management in Africa has in the last two centuries demonstrated a high preference for programs, initiatives and strategies that deprive rural communities of the resources they have subsisted on for years (Olekae, 2006). These conservation and resources management strategies are characterised by top-down decision-making arrangements and conflicts between rural



communities and conservation agencies. This results from the inability of conservation agencies to recognize that indigenous rural economies were directly linked to the same natural resource base and the management strategies introduced were perceived by the locals as exclusionary to the rural communities (Olekae, 2006).

In West Africa, there have been incidents of the expulsion of local communities from their settlements without adequate provision for alternative sources of livelihood. In some cases, indigenes are restricted from accessing common property resources to gather food, harvest medicinal plants, graze their animals, fish, hunt and collect fuelwood, oysters and other natural resource products from forests, wetlands, rivers and pastoral lands. This situation turn's local people from prestigious hunters and cultivators to "poachers" and "squatters" overnight (Colchester, 1994 as cited in Sheppard et al., 2010). Resulting in massive resentment and apathy by these rural communities towards any conservation attempts, which has thwarted the efforts of conservation and management agencies, because they were managing declining natural resources without a clear appreciation of the root causes of the decline in those natural resources.

Ghana in the 1970s experienced its share of the establishment of national parks by the government of the first republic, strictly denying resource use to local people living in and around these areas resulting in a severe reduction in the incentive of local communities to participate in conserving these resources. Such approaches to natural resources management have led to calls from the international community for the need to link social development with environmental protection (Khadka and Nepal, 2010). The concept of linking conservation with development has resulted in a major paradigm shift in conservation, from the strict protectionist approaches to more people-centred/collaborative approaches (Kalamandeen and Gillson, 2007; Büscher, 2016), in



the early 1980s.

The Community Based Natural Resource Management (CBNRM) Concept known as the Community Resource Management Areas (CREMA) mechanism was introduced by the Wildlife division as a policy shift by providing rural communities, landowners and land users the opportunity to govern, manage and use sustainably, forest and wildlife resources within the boundaries of the CREMA, and to tangibly benefit financially and in-kind therefrom. The CREMA process since its introduction has followed nearly two decades' evolution from concept to a certified pilot initiative and finally to a fully authorised mechanism, which is now seeking full legal backing from Parliament (Asare et al, 2013).

As originally conceived, the CREMA approach provides a mechanism by which the government of Ghana through the Wildlife Division could transfer management authority and responsibilities for wildlife to rural communities. Geographically, it denotes a defined area that is endowed with sufficient natural resources where the people had organised themselves into units for sustainably managing their natural resources. The mechanism aims to encourage rural folks fringing protected areas to integrate wildlife management into their farming, land - use and management systems as a legitimate option. The CREMA mechanism officially emerged as a concept from the 1994 Forest and Wildlife Policy, but it took a little over the decade to be put into action by eligible communities. (Rebecca et al., 2013).

These initiatives have resulted in various successes ranging from decreases in poaching, improved conservation and provided direct economic benefits (Wainwright and Wehrmeyer, 1998). Experience from community-based conservation schemes has shown a degree of success, especially for sites where big game animals are present



(Hackel, 1998). There are however growing concerns that these schemes have been successful in protecting some larger mammals and trees but is yet to record noticeable success in the equitable distribution of socio-economic benefits (Gibson and Marks, 1995). In some cases, reports have it that, wildlife poaching has encountered a decrease as a result of the programmes, as poachers have shifted their tactics and prey selection (Gibson and Marks, 1995). In many of these initiatives, communities are not actively participating in planning and management as expected (Songorwa et al., 2000). This is due to the absence of local-level institutions, resulting in the district- or state-owned institutions, controlling management decisions (Metcalf, 1994). There is also evidence of conflicts between rural peoples' economic needs and the demands of government-controlled initiatives and therefore the implementation of community-based conservation as an alternative (Hackel, 1998). Other suggestions have it that community-based conservation has rarely improved the standard of living of local communities (Wainwright and Wehrmeyer, 1998), thereby raising further concerns about its sustainability.

Despite the myriad of success stories as well as challenges, the sustainability of this community-based approach remains one unanswered question (Hackel, 1998). Thereby, making it difficult to define the situation under which the approach is most likely to be sustainable. That notwithstanding, the community-based natural resource management approach is continuously being promoted in many countries, including Ghana without an empirical assessment of the prospects and challenges of the existing CREMAs to serve as a basis for the direction to sustainable management of CREMAs.

1.2 Problem Statement

The Black Volta basin over the last two decades has been a hot spot for the implementation of the CREMA mechanism, Ghana's version of the CBNRM approach. The mechanism has



quite recently been criticised for failing to deliver on its mandate as a framework for effective conservation of natural resources and a source of tangible benefits to communities to whom management and user rights of their resource has been devolved. These criticisms have led to observers and practitioners questioning the validity of the approach whilst dampening the enthusiasm among some major stakeholders (Roe, 2008). A situation emanating from the fact that there is a paucity of data and information on CREMA sustainability drivers such as:

- The mechanisms contribute to the effective conservation of natural resources.
- Benefits accrued to the CREMAs and distribution criterion
- Communities' representation in management and governance structures and their effectiveness.

This study seeks to address this data gap by assessing the socioeconomic and ecological motivations, incentives, initiatives, and practices of CREMAs in the Black Volta Basin to form a basis for the continuing debate on the sustainability of Protected Areas under the Mechanism.

1.3 Research Question

1.3.1 Main Research Question

The main question addressed in this research work is; how sustainable are Community Resource Management Areas in the Black Volta basin?

1.3.1.1 Sub-Research Questions

The above main research question was addressed through sub-questions including.

- i. To what extent has the CREMA mechanism contributed to the conservation of biodiversity?
- ii. How effective are the benefit-sharing schemes of the CREMAs?



iii. How effective are the existing management and governance structures of the CREMAs?

1.4. Research Objectives

1.4.1 Main Research Objective

The main objective of this study is to examine the sustainability of Community Resource Management Areas in the Black Volta Basin. This will be achieved through the following sub-objectives

1.4.2.1 Sub- Objectives

- i. To assess the contribution of the CREMA Mechanism to effective conservation and Natural Resource management.
- ii. To examine the benefit-sharing Scheme of the CREMAs
- iii. communities through the implementation of the CREMA Mechanism.
- iv. To evaluate the effectiveness of existing management and governance structures of the CREMA.

1.5 Significance of Study

The CREMA Mechanism which is Ghana's version of the CBNRM approach was adopted in the Black Volta basin to sustainably manage natural resources through community-based initiatives and governance while ensuring that benefits are generated for the indigenes who live with and depend on these resources. Its ability to meet this mandate has been heavily questioned by sceptics due to the unavailability of data and information in that regard.

This study sought to explore and assess how the mechanism has contributed to the management of natural resources sustainably, the benefits accrued and mode of distribution and the effectiveness of management and governance structure under the mechanism

It would inform stakeholders and partners of the potentials for future modification of the



CREMA Mechanism in mitigating and solving other environmental resource problems and also, generate recommendations for detailed evaluation and implementation of other community based natural resource management initiatives.

1.6 Scope of Study

The study was conducted in the Wechiau, Dorimon and Zukpiri CREMAs in the Black Volta basin of the upper west region of Ghana which covers about 8,370km², making up 42% of Ghana's portion of the basin.

These three CREMAs especially Wechiau and Zukpiri were chosen for the study on the basis that they are among the first CREMAs established under the CREMA mechanism and are perceived to have recorded some level of success.

Despite attaining different stages of development, they are located in the same agro-ecological zone with similar histories, characteristics, and problems such as minimal rainfall and poverty.

This study assessed the perceived successes of the CREMAs in the Black Volta Basin while evaluating the available potentials for sustainability with regards to natural resource management; benefits availed to CREMA communities and members and the effectiveness of the governance and management structures of the CREMAs. It was restricted to the riparian zones and fringe communities of the study area.

1.7 Organisation of the Thesis

This thesis comprised five chapters. Chapter one introduced the study by providing background to the problem statement, objectives, significance of the study, and scope. Chapter two then provides the literature review relevant to the study. It focused on the history of natural resource management, conventions of resource management and



management of natural resources under the CREMA mechanism in the Black Volta basin. It defined community base natural resources Management, its successes, challenges and factors for sustainability. Chapter three contained the research methodology, describing the methods and processes used to collect and analyze data for the study, the general overview of the Volta basin, zeroing down to the study areas. Chapter four comprised the results and discussion, whilst the final chapter, Chapter five contained the summary of the findings, conclusions, and recommendations of the study.



CHAPTER TWO

2.0 Literature Review

2.1 Concepts

2.1.1 Community Natural Resources

Allan Johnson (1986) defined Community as “a collection of people who share a common territory and meet their basic physical and social needs through daily interaction with one another”. By this, in the context of the study, a community is seen to imply that people live in a defined area, have a sense of belonging and participate in organised relationships that assist them in pursuing their common socio-economic goals and interests which may or may not relate to natural resources.

Natural resources, according to World Trade Organisation (WTO), as cited in Gilbert, (2018) are “stocks of materials that exist in the natural environment that are both scarce and economically useful in production or consumption, either in their raw state or after a minimal or substantial amount of processing”.

Relating the concepts of community and natural resources, community natural resources are therefore the natural resources found in the natural environment of a given community, which are developed with or without the intervention of humans/community members.

Community Natural resources are valuable in supplying human necessities and comfort as well as providing ecosystem services that maintain the health of the biosphere. Natural resources include Air, Land, water, natural gas, coal, oil, petroleum, minerals, wood, topsoil, fauna, flora, forest and wildlife.

Some of these resources are renewable in that they can reproduce, or replenish themselves after use and these include wildlife, plants, trees, water and wind. However, the ability of these resources to regenerate depends on the rate at which they are extracted and supported



by way of management practices. Though they are renewable, if the rate of extraction excessively outpaces the rate of regeneration and management efforts, their renewable character diminishes, and their sustainability becomes a concern to all.

Non-renewable resources are those resources that are irreplaceable in the foreseeable future once extracted from water or soil and include gold, silver, fossil fuels, diamonds, natural gas, copper, and ore (Gilbert, 2018).

2.1.2. Natural Resource Management

Natural Resource Management (NRM) is explained in several ways by different authors namely Shanker, (2011) and Lokendra Thakkar (2012), view Shanker (2011), natural resource management is the planning and care of resources to secure their judicious use and continuity of supply while maintaining and enhancing their quality, value and diversity. Also, Lokendra Thakkar (2012) is of the view that natural resource management refers to the management of natural resources such as land, water, soil, plants, and animals, with a particular focus on how management affects the quality of life for both present and future generations (stewardship). Based on these two views, it is clear that natural resource management should influence positively how people and natural landscapes interact. It must integrate land use planning, biodiversity conservation, and the concept of sustainability (Lokendra Thakkar, 2012). It recognises that people and their livelihoods rely on the health and productivity of natural resources, and the actions of the people as stewards of natural resources play a critical role in maintaining the health and productivity of these resources. Natural resource management is also congruent with the concept of sustainable development (Lokendra Thakkar, 2012).

2.1.3. Community Based Natural Resources Management

Community-Based Natural Resource Management (CBNRM) is a framework for advancing



and integrating community livelihood and conservation objectives. It has been widely promoted as a strategy that aims to conserve biodiversity while enhancing rural livelihoods. The underlying rationale is that devolving control of natural resources to local communities will enhance households' access to and participation in the management of these resources, thereby improving the resource base and their benefits to communities (Lund, 2007).

Child and Lyman (2005) explained that it is a process by which landholders gain access, use or ownership rights to natural resources to enable them collaboratively and transparently to plan and participate in the management of natural resources to achieve and maximise financial and other benefits. It is believed that by transferring ownership or user rights from the Government institutions to local communities, CBNRM can provide communities with the necessary economic incentives to conserve and sustainably utilise their natural environment and wildlife resources (Bond *et al.*, 2006). (Gosling, 2011) also viewed CBNRM as an approach that combines natural resources conservation and rural development. Other definitions of CBNRM have been given by different players in the field of conservation (Dressler *et al.*, 2010) but they all emphasise the importance of community involvement and effective participation in conservation and natural resources management to enhance sustainability resources and community development. They also stressed that the approach must be community-based in that, the required legal rights to manage the resources are given to the community and the local institutions as well as the economic incentives to take substantial responsibility for sustainable use of the resources. These communities become the primary implementers of natural resources management plans, assisted, and monitored by technical experts.

The definition by Bond *et al.* (2006) provides more clarity encompassing issues alluded to in all other definitions and is considered for this study. There are quite a several pertinent Environmental and socio-economic challenges and concerns in the current millennium that



requires innovative solutions and actions (Kates *et al.*, 2009). CBNRM emphasises the significance of environmental resources in community development and the need to engage communities and promote their effective participation in the development process. In line with the above, Mbaiwa (2011) indicates that “sustainable community development and natural resources management have become intertwined”.

2.1.4. Sustainable Natural Resource Management

The concept of sustainable development emerged from environmental thinking concerning the limitations of our natural resources and the continuous use of our ecosystems. Action plans for sustainable development captured in Agenda 21, emphasise the need for the integration of environmental concerns into the development needs of communities and have these communities participating effectively in the management of natural resources. The main aim of the CBNRM concept is to achieve sustainable development by putting more attention on the significance of participatory local democracy in the management of the natural resources, whereby decision-making powers, and the right to apply accountability are bestowed in the people rather than in committees and managers (Child *et al.*, 2009). CBNRM further assumes that the community makes the decisions and community-based institutions lead the enforcement of regulations (Bell and Morse, 2008). The attainment of sustainable development is dependent on the effectiveness and success of CBNRM. In line with the above outlined global trends, the government of Ghana adopted the CREMA mechanism in the early 90s as a strategy to promote and ensure sustainable development and the maintenance of the country’s environmental integrity. The Black Volta basin with its rich diversity of both fauna and flora quickly became a preferred spot for the pioneering of this perceived life-changing concept which was unanimously embraced and accepted at the Rio Conference of 1992.

Sustainable natural resource management as defined in the Environment Act of Wales



(2016) is: “the usage of natural resources in a way and at a rate that maintains and enhances the resilience of ecosystems and the benefits they provide. In doing so, meeting the needs of present generations of people without compromising the ability of future generations to meet their needs, and contributing to the achievement of the well-being goals of future generations” (Victoria, 2018).

Sustainable Natural Resources Management is crucial to ecosystems resilience which itself underlines human well-being (Seidl, 2014). Human development and wellbeing are dependent on the availability and quality of natural resources. Natural resources are a source of power for social and economic development (Victoria, 2018). Recognising this, the natural ecosystems of the world are being put under pressure to expand and provide the needed supply of fuel, fibre, and food among other commodities sustainably, while ensuring such services as clean water and air catered for (Victoria, 2018). The current emphasis on sustainability is traced back to the early 19th century when attempts were made at understanding the ecological environment of North American rangelands. The analysis coalesced during the 20th century with the recognition that the preservationist conservation strategies were not effective in halting the continuous reduction in natural resources. To ensure the integration of cultural economic, social, and political aspects of natural resources management, a new approach was later implemented. (Victoria, 2018).

2.2 Natural Resources Management

2.2.1. History of Natural Resources Management

The African Continent is rich in various natural resources. These include forests, wildlife, minerals, water, mountains, and sources of energy. These natural resources are fundamental to and drive socio-economic development nationally and regionally. The recent threats of depletion of these resources in the face of climate change have pushed organisations and



professionals in the environmental and resources management sector to reengineer the best appropriate approaches and practices toward maintaining environmental integrity the world over and ensuring the sustainable management of natural resources.

The objective of the Environment and Natural Resource Management sector is to promote sustainable use and management of natural resources through effective and efficient governance, with a focus on reduction in deforestation and carbon emission as mitigation and or adaptive measure to climate change while affording communities tangible reasons to maintain efforts at sustaining the status of all resources for inter-generational benefits.

There is but an abundance of literature on Natural Resources Management and Governance, more especially in Africa and Ghana to be precise. Natural Resources Management has received substantial attention over the years due to population increases that had resulted in the need for increased supply of botanical consumables, increased demand for raw materials by a growing industrial sector and the unsustainable exploitation of natural resources beyond acceptable limits.

In this section, I seek to present available literature on the history of Natural Resource Governance in Africa and this, I synthesised into four regimes: pre-colonial, colonial, post-colonial and integrated Natural Resource Governance approaches. (Mensah, 2017)

2.2.2. Pre-colonial natural resource governance:

This dates back to the pre-1870s when traditional institutions dominated Natural Resource Governance. During this era, traditional rulers and belief systems steered Natural Resource Governance. Chiefs, the traditional head of communities assumed land allocation and distribution powers and were also the custodians of traditional values. (Mensah, 2017) They were ably aided by councils of elders, landlords and fetish priests who provided technical and spiritual advice into how resources were managed and governed. Natural Resources



Governance then was epitomised by their deep commitment to societal interest, which amounts to deep reverence of societal good (Chigwenya *et al.*, 2007). This era was characterised by various forms of conservation practices and initiatives which were largely deliberate. Some areas, notably shrines and sacred grooves which held religious and cultural values were strictly protected and remained in their natural state for a long period. Access to certain resources e.g., birds, primates, plants among others was restricted because of their scarcity and/or specific value to specific groups, thus serving totemic purposes (Katerera, 2001). Beliefs and taboos were the principal rules that shaped access and exclusion to natural resources even where the resource was a common pool resource. Violation of such rules was perceived to have catastrophic ramifications, including Death, diseases outbreaks, droughts and famines (Resource Africa, 2002). As such, various sanctions, including payment for sacrifices, banishment and even death sentences were instituted to deter people from breaching such provisions. Pre-colonial Natural Resources Governance successfully integrated traditional and socio-cultural traits with environmental conservation needs. This gave the approaches the required moral and political legitimacy at the local level, making them stable and enduring (Chigwenya and Manatsa, 2007) at least for a very long time. Though colonial Natural Resources Governance tried to obliterate remnants of the pre-colonial era, it could not be due to the complexity of reasons.

Existing National parks and protected areas such as The Matopos National Park and Mayhuradonha in Zimbabwe, the Kalahari game reserve of Botswana and the Mamili National Park in South Africa remain a testament to the effectiveness and ingenuity of pre-colonial approaches to Natural Resources Management and Governance (Murombedzi, 2003) in Africa.

2.2.3 Colonial period of Natural Resource Governance

This period dates back to the early 1870s when the slave trade was no more profitable and



the dawn of the industrial revolution. Driven by the demand for guaranteed sources of raw materials, the search for reliable markets and profitable investment outlets, Africa became the ultimate target by European imperialist aggression, military invasions, diplomatic pressures, and eventual conquest and colonisation (Chigwenya *et al.*, 2007). The central feature of Natural Resources Governance during this era was command and control, where the colonial government became the prosecutor, judge, and executioner in all affairs of natural resources. They expropriated land and other natural resources from Africans (Chigwenya and Manatsa, 2007), promulgated and enforced laws with very little input and consideration of the norms, values, and priorities of the indigenous people. These laws in most cases were unfavourable, disrespectful, and inimical to the values and norms that kept and united the indigenous populations and their resources. The era was characterised by a lack of common vision, no community involvement, stiff competition for resources, absence of ideas and benefits sharing and most critically unhealthy confrontations between colonial governments and local communities (Katerera, 1999). The apparent lack of community involvement resulted in the emergence of elements of open access systems, where individuals began to invade the commons as a collective sense of proprietorship (Antonio, 2001). It is perceived that unsustainable resource use was birthed during this era. Whilst the colonial government was busy exploiting and exporting resources to meet their economic needs and excluding the true owners of the resource; local communities who just feel that they were being excluded from resources they have lived with and benefited from for generations, began to defy the status quo and engaging in illegalities, including poaching of wildlife. These acts began to provide grounds for the overexploitation of resources. Not much was done at curtailing the developing trend in of the resource then, so far as the target resources of the colonial power was easily accessible and locals pretended the resources were too vast to be depleted.



2.2.4 Post-colonial natural resources governance

Post-colonial Natural Resources Management and Governance were not very different from the colonial era. Natural Resources Management and Governance became even more centralised and state-controlled. The most observable change then was only with institutions, where colonial leadership was replaced by national heads of state of independent countries. Local governance institutions which pushed and successfully managed natural resources in the pre-colonial era were eroded by Colonialism leading to an era, where political leaders who emerged in the post-colonial era thought they knew best how to govern natural resources (Mensah, 2017). Authoritarianism ensued and it created a vacuum for some unscrupulous leaders to enrich themselves whilst the locals who are true owners of the resources were left impoverished. Such disenfranchisement and rent-seeking behaviour resulted in dissent amongst civilians and military alike and fueled civil conflicts in most parts of the African continent (Mensah, 2017). These civil wars deepened the woes of natural resources as protected areas were without restrictions and exploitation by users was without limits.

Even today, such regimes are reported in countries such as Angola, Mozambique and Equatorial Guinea and the like. On the latter, Human Right Watch (2017) reports that “the nation’s enormous oil revenues fund lavish lifestyles for the small elite surrounding the president, while a large proportion of the population continues to live in abject poverty. Mismanagement of public funds and credible allegations of high-level corruption persist, as do other serious abuses, including arbitrary detention, unfair trials, and torture” (Mensah, 2017).

Efforts made by civil society and conservation focus organizations’ at changing the status quo has often been met by frustrating legal bureaucracies of target regions and countries.



2.2.5. An Integrated Approach

This era commenced late in the 20th century, especially after the Stockholm and Rio Conferences in 1972 and 1992 respectively. This emerging paradigm is characterised by a departure from centralised and state-controlled governance regimes which failed overwhelmingly in their attempts at sustainably managing natural resources. At the core of this is a demand to shift from the command-and-control approach to more organic approaches which evolve from the people and are for the people (Katerera, 1999, Campbell *et al.*, 1996). This approach promotes sharing of power and resource rents between actors and empowers the grassroots to decide access and utilisation of natural resources sustainably. The approach also strongly promotes principles of equity, transparency and accountability.

Ghana Multi-stakeholder dialogues towards effective NREG Resource management policy is developed based on consensus from stakeholders at the community, district, and regional level. Policies initiated from this approach such as the CREMA mechanism, modified taungya system which farmers are given access to degraded forest reserve areas for tree planting with the integration of food crops until tree canopy closure (Acheampong *et al.*, 2016), and artisanal timber milling have had a significant positive impact on reducing conflicts and illegalities in forestry (McKeown *et al.*, 2013; Obeng *et al.*, 2014; Acheampong *et al.*, 2016). Whiles providing sustainable livelihoods for communities who live with or within the resources.

In Botswana, Namibia, Burkina Faso, Tanzania and Zimbabwe, Community forestry Communities with the help of other stakeholders established versions of the CBNRM project, and with incentives and training from government and NGOs, the communities can meet their management objectives and improve their welfare in a manner that reduces their tendency to engage in illegalities and its associated insecurities (Chitombe, 2012;



Coulibaly-Lingani, 2011; Nelson, 2010). With regards to Resource rent sharing, Resource revenue is shared between state and non-state actors in a mutually beneficial manner. (Brosio and Singh, 2013).

Established in 1993, The Ghana Mineral Development Fund receives 20 per cent of mining royalties. Half of this fund is earmarked for investment in mining-affected communities, 25 per cent is disbursed through the district assemblies and the remainder goes directly to target local communities. (Mensah, 2017) Uganda Mining Act of 2003 established that the central government is entitled to 80 per cent of mining royalties, local governments in resource-producing areas are entitled to 17 per cent and landowners receive 3 per cent. (Brosio and Singh, 2013)

2.2.6. Fortress system of Natural Resources Management

Biodiversity conservation in its early days was motivated by a genuine desire to preserve sites with special meaning for the intellectual and aesthetic contemplation of nature, and by the acceptance that the human conquest of nature comes with it a moral obligation to ensure the survival of threatened life forms (Ladle and Whittaker, 2011). Over the past century, various conservation-oriented strategies have been enacted on local and regional scales, such as the establishment of protected areas. A protected area according to IUCN (2008), is a clearly defined geographical space, recognised, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

Protected areas span's almost 13% of the Earth's land surface (Chape *et al.*, 2003). In some parts of the world vast areas have already been transformed by anthropogenic activities, making protected areas the only remaining natural or near-natural ecosystems (Stolton *et al.*, 2015).



Dudley (2008) has it that, protected areas are essential to national and international conservation efforts. For that matter, protected areas are considered as ecosystems in which science-based directed efforts are employed for the protection of wild species and the maintenance of the health and integrity of ecosystems to ensure the continued survival of endangered species (Stolton *et al.*, 2015). There has been a strong recognition of the ability of a healthy ecosystem to provide a variety of ecosystem services that support and ensure oxygen production, food security, water infiltration, pollination reduction and climate regulation among others (MEA, 2005). Protected areas offer a ‘natural solution’ for climate change adaptation (Dudley *et al.*, 2004). Through their role in maintaining species populations and diversity and ecosystems and their services. They also contribute greatly to climate change mitigation through their effectiveness in carbon sequestration (Sharma *et al.*, 2013).

A majority of all protected areas established in the early to late 1870s were managed under the “fortress” system of conservation. As a model for protected area-based conservation, fortress conservation (as described in the theory entitled Centralised Conservation) is defined in the Sage Encyclopedia of Environment and Society (Robbins, 2007) as follows:

Fortress conservation as a model for protected area-based conservation is defined by the Sage Encyclopedia of Environment and Society as, a conservation model based on the belief that biodiversity protection is best achieved by creating protected areas where ecosystems can function in isolation from human disturbance. Fortress, or protectionist, conservation assumes that local people use natural resources in irrational and destructive ways, and as a result cause biodiversity loss and environmental degradation. Protected areas following the fortress model can be characterised by three principles: local people dependent on the natural resource base are excluded; enforcement is implemented by park rangers patrolling the boundaries, using a “fines and fences” approach to ensure compliance; and only tourism,



safari hunting, and scientific research are considered as appropriate uses within protected areas. Because local people are labelled as criminals, poachers, and squatters on lands they have occupied for decades or centuries, they tend to be antagonistic toward fortress-style conservation initiatives and less likely to support the conservation goals."

Fortress conservation occurs when you have a highly centralised protected area that installs strict prohibitions to user access with intensive monitoring and strong sanctions by the government. (Ostrom and Nagendra, 2006).

Critics of this approach have emphasised that the processes of protected areas establishment are carried out without the inclusion of the local custodians in important issues and decisions regarding protected area siting and rulemaking. These results in former local resource users becoming refugees to the process, with very few sustainable livelihood alternatives and incentives to help them comply with rules and regulations, while also experiencing a drastic decline in the welfare community members. Ostrom and Nagendra (2006) indicate that, though little attention is given to local participation in decision making regarding protected areas, rarely have the monitoring and enforcement capacity to control large swaths of land succeed without local support, Where the is the antagonism from the local front is strong, the situation leads to the so-called "paper parks", where areas said to be under conservation, exist only in a legal document (Ostrom and Nagendra, 2006). Therefore, where government and civil society organizations can effectively monitor and control the boundaries of a protected area, it simply results in a shift of degradation from within protected areas to the outside. A situation is termed "spillover effects" or leakage (Forcada *et al.*, 2009). The final result becomes a decline in the condition of the commons

2.2.7. Challenges associated with the fortress system of Natural resources management

Biodiversity and ecosystems conservation is critical to ensuring sustainable development,



mitigating, and adapting to the effects of climate change as well as preventing the collapse of life-supporting ecosystem services (Young, 2012). Gashaw (2015) observed that protected areas were established to protect major ecosystems and biodiversity the world over. This pressing need for natural resource conservation led to the establishment of national parks around the world dating back to the early 1870s.

National parks according to NSW (2015), are vast areas of land, reserved and protected to conserve native plants and animals, their habitats, historical heritage, places of natural attractiveness and indigenous cultures. A couple of these parks and protected areas serve as gene-banks while others are centres of traditional ecological knowledge that have a direct economic benefit to their host countries, generating significant international revenue from carbon trading and tourism (Young, 2012).

The creation of these parks which are managed by government-appointed officials under the “fortress” system was not just opposed and resisted by the indigenes in the areas where they were created but was also accompanied by numerous challenges that threatened their survival and sustainability, resulting in them becoming the main cause of the depletion of the natural resources they are meant to conserve.

These challenges range from lack of sense of ownership, through conflict over resources to illegal activities and poverty and they include the following.

I. Lack of a Sense of Ownership

The most affected stakeholder in the establishment of National Parks (Kebede *et al.*, 2014) is the local communities. It is therefore imperative to involve local communities as equal partners in the planning, development and implementation of conservation strategies that affect their territories and resources. Most particularly, the establishment and management of National Parks (Beltrán, 2000) which encompasses complex relationships and interlinked



activities. The successful management of protected areas depends highly on the establishment of trust between local communities and government or the implementing organization as well as the acceptance of the initiative and cooperation of fringe communities in conservation activities.

Even though local communities are provided with some level of representation and participate in diverse conservation and management activities of national parks, such as safeguarding and providing information on illegal activities in those parks (Gashaw, 2015), they are rarely engaged in active park planning and management decisions (Asmamawu & Verma, 2013; Petros *et al.*, 2015). Their lack of involvement in decision making regarding the parks creates a feeling of neglect and the understanding among the locals that the parks are government-owned which and for that matter, affects the cooperation and acceptance of community members in ongoing and future conservation activities.

The situation is even worse when the communities whose lands and access to natural resources are sacrificed for the creation of national parks.

II. Limited Awareness

Proper community entry process to create awareness is very important and should be considered first in the implementation of actions towards protected area conservation (Gashaw, 2015). In doing so, the local communities should be fully educated on the economic, social, and environmental significance of these protected areas before, during and after their establishment (Kebede *et al.*, 2014). Government controlled National Parks and protected areas under the “fortress” system of conservation are bedevilled with numerous problems for the fact that communities fringing the parks have very little knowledge of these parks and their economic, social and environmental importance (Tesfaye, 2017) the region and country. The lack of awareness on the part of the fringe



communities has always been a major challenge to conservation efforts.

III. Natural Resources related Conflicts

Conflict according to Teferra and Beyene (2014), is characterised by a relationship between two or more parties who might for some reason have conflicting interests, goals, values, norms, or behaviours. Natural resource management comes with conflicts, and this is usually a result of competition and disagreements between two or more parties over access and use of one or more scarce resources (Grimble, 1998). Most of the conflicts within national parks can be said to be the outcome of differences in goals, interests and aspirations that groups and individuals within legally established and isolated environments harbour, all of which often have a positive or negative impact on the asserted value of the resources in the area (FAO, 2000).

Natural resources related conflicts occurring in protected areas under the fortress system of resource management are categorised into three namely.

- Human-wildlife conflicts (Berihun *et al.*, 2016),
- Conflict between park management and fringe communities to national parks (Asmamawu and Verma, 2013), and
- Conflicts between fringe communities settled around the park (Ashenafi and Leader, 2005).

Human-wildlife conflicts have become a global phenomenon, occurring all-round the globe (IUCN, 2005); developing countries however are more vulnerable to the scenario and are always hardest hit compared to their developed counterparts (Berihun *et al.*, 2016). The rapidly growing populations in developing countries, expansion of settlements that cause habitat loss (Mwamidi *et al.*, 2012) and poverty has been suggested as the basic causes for the high human-wildlife conflicts. Other conflicts that mostly occur between park managers and fringe communities are associated with Resource use exclusion which is seen as an



illegal activity perpetrated by locals or external individuals in their attempts to access resources from the park as well as crop damage by wild animals (Asmamawu and Verma, 2013; Kebede, 2014; Berihun *et al.*, 2016). Border and resource competition are other common causes of conflicts that happen between different fringe communities (Mulualem and Tesfahunegny, 2016).

IV. Issues of Boundary/Lack of Boundary

Boundary demarcation of the national parks and protected areas is an important component for the development of management plans. Where demarcation of a protected area is not well negotiated and defined, the obvious outcome is continuous conflicts which turn to a challenge in the effectiveness of management and conservation of these areas and their resources (Petros *et al.*, 2016; Zerga, 2015; Teferra and Beyene, 2014).

V. Poverty

Fortress conservation models are prominent in poor countries of Africa and Asia where weak capital accumulation, high levels of unemployment, low income, low productivity, and investment has always been the main features of their economies (Moges, 2013).

Ethiopia for instance is recognised as one of the world's poorest countries despite being among the top 25 biodiversity-rich countries. It is host to two of the world's biodiversity hotspots namely: the Horn of Africa and the Eastern Afromontane hotspots (WCMC, 1994). There is however a decline in the country's biodiversity according to IBC (2014), which cites poverty among others as the major cause for the decline, resulting from the direct dependence of its citizenry on natural resources for survival.

2.3. Paradigm shifts in Natural Resources Management

2.3.1 Collaborative Natural Resources Management

Continuous efforts are being made to resolve multi-scale socio-environmental dilemmas associated with biodiversity conservation and protected areas management. These efforts



will usually succeed through institutional development, effective collaboration and social learning to build trust.

The adaptive co-management approach is the emerging strategy being adopted at addressing the identified dilemmas.

The adaptive collaborative co-management strategy draws attention to the learning and collaborative functions required for the improvement of our understanding of, capacity and ability to adequately respond to the complex economic, social and ecological system. (Armitage *et al.*, 2009).

Collaborative natural resource management approaches have become “hotcakes” and have shown lots of promise in dealing with complex and continuous natural resources issues. (Conley *et al.*, 2003) It is increasingly being emphasised by land management agencies and stakeholders to address natural resource management issues and implement adaptive management. There is a strong desire by proponents and critics of collaborative resource management to evaluate the new approaches as the collaborative efforts of the strategy become more widespread and are gradually being incorporated into official policies, (Cullen *et al.*, 2010).

Management of Natural Resources is highly complex. Its complexities don't only affect the biological value of the resource but also its cultural, economic, social, and other associated values within constituent communities as well as nearby communities. Addressing these pertinent issues and complexities requires policy directions that ensure public involvement, where individuals who will be directly affected by natural resources management activities are brought to the table and given the needed opportunity to weigh in on the decisions, actions, and regulations.



In the context of this study, collaborative natural resources management is viewed as shared decision-making over the care and use of natural resources by the State and communities using the resource. (Moote, 2008). Collaborative resource management is also said to refer to; management arrangements between multiple partners and stakeholders which are recognised by the government. These may include privileges and a set of rights. It is as well, the process among resource users, stakeholders, and other interest groups for the sharing of decision-making powers and exercise of control over resources.

Collaborative NRM includes a wide range of initiatives featuring innovative approaches to the natural resources management and the environment, examples include watershed partnerships, integrated watershed management (Blomquist and Schlager, 2005), , integrated environmental management (Cairns and Crawford, 1991; Margerum and Born, 1995), ecosystem management (Slocombe, 1993; Grumbine, 1994; Cortner and Moote, 1999), integrated water resources management (Mitchell, 1990b; Jønch-Clausen and Fugl, 2001; Mitchell, 2005), co-management (Carlsson and Berkes, 2005), integrated coastal management (CicinSain and Knecht, 1998), integrated resource management (Mitchell, 1986; Bellamy *et al.*, 1999; Bellamy and Johnson, 2000), integrated catchment management (Mitchell and Hollick, 1993; Johnson *et al.*, 1996), CBNRM (Lane and McDonald, 2005), among others.

Despite the existence of a lot of similarities between these approaches, their strategies vary considerably in terms of scope and focus. Their common characteristics include.

- Devolution of some degree of management rights and decision-making powers to local actors and organisations.
- Planned holistic and systematic approach to natural resource management that recognises the connections, complexities and interrelationships among ecological process, components,



resource use and jurisdictional issues.

- balancing resource exploitation and addressing interrelated and multifaceted socioeconomic and natural resource management problems.
- Systematic coordination of programmes, activities and policies designed and implemented by communities, governmental and non-governmental organizations.
- Provision of inclusive platforms for the participation and involvement of a broad array of stakeholders from the public as well as government and civil society organisations.
- Successful integration of scientific and indigenous knowledge.
- Adoption of alternative Conflict resolution methods through mediation and negotiation among parties.

Current thinking on Collaborative management of natural resources has led to the enhancement of democracy locally, increased government legitimacy and accountability, empowering of the marginalized and vulnerable segments of society and improving equity in the sharing of benefits. The development of these collaborative approaches over the past few decades is in response to the shortfalls of the traditional protectionist approaches which are mostly based on command-and-control strategies (Sabatier *et al.*, 2005).

Australia for instance is an example of a country where the traditional protectionist approaches to natural resource management accounted for the impromptu decision making and piecemeal action in addressing natural resource management challenges and problems (Bellamy *et al.*, 1999).

The emergence and increased reliance on collaborative natural resources management have been influenced by other factors which include (Wondolleck and Yaffe, 2000):

- Acknowledgement of the problems and challenges of past policies and management



actions.

- Consideration of the current social and organizational context of resource management.
- Legislative and administrative impasses at various levels of decision making, which mostly come with a high cost of transaction involving time, money, and human resource.
- Reduced NRM budget for government agencies, understaffing and resource constraints

It has come to common knowledge that NRM problems of recent times cannot be solved with the only traditional approaches (Born and Genskow, 2001). For instance, Catchments are seen as a complex system that features interlinked transboundary ecological processes. They present complex upstream and downstream interactions with multiplex cause-effect relationships (Heathcote, 1998). These catchments also host many, splinter, and sometimes opposing interest groups and communities. (Brunckhorst and Reeve, 2006), while also featuring multiple resource uses and property rights.

Furthermore, the jurisdiction of catchments spans multiple boundaries, where the responsibility and rights over natural resources management are fragmented and involve numerous departments and agencies at multiple governmental levels. (Burton, 1985). The intricate nature of natural resource management presents serious complications to the traditional policies which are based mostly on standardised rules and regulations enforced by a central agency (Lubell, 2004). Collaborative approaches for that matter espouse strongly the notion that there are no short-term or simple remedies, nor isolated perspectives to the complex problems of natural resources management within regional context or catchment context. These problems are deemed to surpass the scope of exclusively technical solutions and government domain alone (Bellamy *et al.*, 1999). Thus, collaborative management of natural resources is regarded as a budding paradigm (Bellamy, 1999;



Cortner and Moote, 1999), which acknowledges the interaction and interdependence of the social, natural, technological and political systems in addressing the network of natural resource management problems which promotes uncertainty, conflicts, mistrust and other societal constraints.

It substitutes the disorganized conflict-prone approaches with more dynamic and inclusive alternatives (Bellamy *et al.*, 1999). Apart from the fact that it gives loads of credence to the involvement and participation of non-governmental organizations and the general citizenry while reducing state control and involvement, these collaborative approaches complement the traditional approaches to natural resources management to enhance efficiency rather than replacing them entirely. (Born and Genskow, 2001).

The complementary capacity of collaborative approaches has over the years been promoted overseas in the USA and other developed countries because they reflect in several growth initiatives such as consensus groups, watershed councils, partnerships and other groups involved in the management of natural resources. (Leach *et al.*, 2002), employing different processes that differ in their levels of formality, scale, involvement, and institutionalisation (Yaffe and Wondolleck, 2003). Collaborative approaches to natural resources management in Australia, manifest in such initiatives as catchment area management, land care initiative and the Natural Heritage Trust (Conacher and Conacher, 2000).

The Community Based Natural Resource Management concept is the manifestation of the collaborative management approach in Africa. In Zimbabwe, CAMPFIRE is the manifestation of the collaborative natural resource management strategy. This was introduced in the early 1980s as a viable strategy to complement the government “fortress” system management.

In Ghana, the approach is called the Community Resources Management Areas (CREMA)



Mechanism with over 40 of such projects established throughout the country. This mechanism of Natural Resources Management has led to noticeable transformations of the local economies of constituent communities through the provision of employment in ecotourism and additional incomes from accompanying sustainable livelihoods.

Notable is the fact that there is relative, few works available on critiques of the collaborative approach to Natural Resources Management, for instance, those raising controversial issues that bother on the appropriateness and effectiveness of the approaches. Fortunately, it has become widely acknowledged that there is urgent to examine such controversial issues associated with collaborative natural resources management, including as a measure of providing a constructive platform of debate (Kenney, 2000; Lane *et al.*, 2004b). Pilot implementation of collaborative natural resources management should be guided by clear academic critique if endeavours in that regard are to be progressively refined (Kenney, 2000; Lane *et al.*, 2004a).

2.4. Uncertainties associated with the CREMA mechanism

In the past various authors and critics have expressed serious reservations about the decision of governments, especially those of Africa and Asia to devolve management rights to communities or enter into community-based conservation schemes (Reed,2008) such as the Community Resource Management Areas (CREMA) mechanism of Ghana.

These uncertainties stemmed from the absence of adequate evidence that community-based conservation initiatives work in practice (Gruber, 2010; Hogl *et al.*, 2012). For that matter, CBNRM has been denoted as a “short term political fad” in Hogl *et al.*, (2012) and as a “fashion” in Bruges *et al.* (2008). Agrawal and Gibson (2001) deepened the atmosphere of uncertainty when they strongly put forward an argument that increased democratic policy and participation could lead to a negative effect, with conservation strategies being



construed as impractical and unattractive.

In the mix of these enormous cynicisms, authors like Brinkerhoff (2002), Plummer and Fitz Gibbon (2004) strongly echoed and defended the importance of community-based conservation, recognising it in their writings and presentations as an important complement rather than an alternative to the efforts made by central governments in natural resource management, (Sheppard *et al.*, 2010).

2.5. Performance of CREMAs in the Black Volta Basin

The Community Resources Management Areas mechanism, the Ghanaian version of the Community-based Natural Resources Management concept was introduced in the Black Volta Basin in the late 1990s by the Wildlife division of Ghana and Nature Conservation Research Centre, a non-governmental organisation with a strong orientation in environment and natural resources management in off-reserve areas to complement governments natural resources management efforts. The two main objectives for the establishment of these CREMAs were to: improve rural livelihoods through benefits from sustainable natural resource management and conserve natural resources. (Hoole and Berkes, 2010). By these objectives, several interventions have been implemented for over a decade. The performance of the CREMAs was then determined in 2010 in terms of Focal species trends, Species richness, threats, ecosystem connectivity, financial viability, Household well-being and employment, economic diversity, empowerment, and problem-solving capacity. The following were the observations made.

2.5.1 Focal species trends

The Hippopotami which have over the years emerged as the focal species in the Black Volta basin has recorded a significant increase in number over the past two decades that these CREMAs were established. The Upper West section of the Black Volta basin covered by



the three CREMAs of Dorimon, Wechiau and Zukpiri hold an average of 56 hippopotami in censuses spanning 2016–2018. With the WCHS recording an average of 30, a drastic increase from an average of 12 was recorded in the 2000 to 2009 census period (Sheppard *et al.*, 2010). The Zukpiri CREMA and Dorimon Paramountcy CREMAs recorded averages of 12 and 17 respectively (NCRC, 2018).

2.5.2 Species richness

A total of 167 bird species was recorded in the 2007 and 2008 survey period (Sheppard *et al.*, 2010), of which the Wechiau CREMA recorded 156 and 120 in the Dorimon and Zukpiri CREMAs respectively. The average species richness is similar in all three CREMAs.

Vegetation cover in the basin is appreciable high with good floral diversity. If anything, detection rates of birds during surveys were higher in habitats that predominantly occurred within the CREMAs (Sheppard *et al.*, 2010), an indication of the good floral density within the CREMAs portion of the basin.

2.5.3 Threats

The main threats to ecosystem wellness and the hippopotami population in the basin have been significantly reduced through the effective enforcement of bylaws and other mitigation measures. Farms and settlements that were originally sited near the river have been moved, to allow for natural regeneration of the riverine forest and to minimize human-hippo conflicts. Fishing in the river is regulated and restricted to some stretches only to protect hippopotamus wallowing zones (Sheppard *et al.*, 2010).

Encroachment on riparian habitats by domestic livestock has been hugely limited through the provision of boreholes (Sheppard *et al.*, 2010) as alternative sources for watering animals, especially in the Wechiau section. Fire belts now surround the core zones of the Wechiau and Zukpiri CREMAs (Agyare *et al.*, 2015). The excessive harvesting of plants and animal products from the core zone has drastically reduced with the implementation of



bylaws and increased patrolling by a ranger. The rangers of the Wechiau Community Hippo Sanctuary are pretty confident and proud to mention that no hippopotamus has been killed in the CREMA since its establishment, whereas 11 were reportedly killed in the basin between 1995 and 1997 (Choribe, 1997).

2.5.4 Ecosystem connectivity

Sighting of hippopotami mostly occurred in the core riparian zones of the CREMAs. Here, their safety from poachers and most basic needs of food is secured. Hippopotami need not more than 100 meters of a river or 4 kilometres of grazing lawns (Eltringham, 2001) to live a comfortable life as most of them primarily reside within an approximated 95 km of the riverine stretch of the CREMAs portion of the Black Volta basin. In the early 1980s, hippopotami sightings south of the Black Volta (Roth *et al.* 2004) are indicative of possible connections that exist with populations upstream and those downstream. The Bui national park which is Ghana's largest remaining hippo population is south of the Wechiau CREMA. This population however is now compromised as a result of habitat alteration from the construction of the Bui Hydroelectric dam. Recent hippopotami sightings upstream on the Bontoli Forest reserve's stretch in Burkina Faso (Sheppard *et al.*, 2010) indicate connections with populations further north. If indeed such connectivity does exist, it should sooner or later benefit Burkina Faso's plans towards reinvigorating the protection of its forests along the Black Volta River, from Bontoli through to Koulbi

2.5.5 Financial viability

Over the years, the internal and external sources of income to CREMAs of the Black Volta basin has been on the increase, especially those of the Wechiau CREMA. The Wechiau and Zukpiri for the last decade have managed to continuously attract external investment from the private sector and a variety of donors and philanthropists. Initial cash investments to the CREMAs were, but grew over time, with the right management action and in line with the



absorptive capacity of the CREMAs (Wells &McShane 2004); internally generated revenue primarily come from ecotourism and is being used to settle remunerations and allowances of staff. Ongoing Technical advice to the CREMAs is continuously being catered for by in-king investments. Visitor numbers to the Basin for ecotourism grew rapidly in the Wechiau CREMA, which is the only CREMA in the base engaged in ecotourism in the first five years, these numbers stabilised at around 1500–1800 annually; with less than 50% of the visitors being Ghanaian. (Sheppard *et al.*, 2010)

Income generated from visitors to the Wechiau CREMA has been used to cover salaries of staff and allowances and stipends of Stakeholders as far back as 2004. Zukpiri and Dorimon rely solely on donor support to remunerate the staff on. Hence, staff sacrifices most of the time due to the unavailability of funding. In addition to the visitor generated income, is the second stream of income which comes from conservation premiums of an organic shea nut collection venture established by the CREMA management in 2008. The shea exporter pays a premium equivalent to 5% of the price paid to shea collectors into a conservation trust fund operated by the CREMA. The premium amounts to about US\$ 1047 in 2008 and approximated US\$ 1559 in 2009. (Sheppard *et al.*, 2010)

2.5.6 Household well-being and Employment

In the Wechiau CREMA, an approximated number of 50 members of the CREMA constituent communities receive incomes from the CREMA regularly. This includes stipends receiving landlords who number 3, 31-41 commissioned workers and 17 full-time salaried workers (Sheppard *et al.*, 2010). About 100 additional individuals benefit from the CREMA through occasional employment, The year 2008, saw the Wechiau CREMA stimulate the creation of additional jobs through value chain development around organic Shea collection and processing. In its inaugural year, US\$ 23082 was a payment earned by 726 women who participated. The number of participants increased to 1010 in 2009 with an



estimated earning projected at US\$ 34564 (Sheppard *et al.*, 2010).

The Zukpiri CREMA current has a 15-man fire volunteer squared with the responsibility of ensuring the integrity of the environment. There is no permanent staff for the Zukpiri CREMA, most of those who are working there are community volunteers on temporal basis. Over 300 women have been engaged in the newly established Shea initiative and 12 others actively engaged in Moringa soap making. (AgNRM, 2017)

2.5.7 Equity

Despite the inordinate authority that exists between the Wala and Dagaaba as chiefs and landowners, infrastructure and employment benefits that accrue to the CREMAs spans ethnic and gender divisions (Sheppard *et al.*, 2010) and CREMA geographic expanse. Representative ethnic groups among employees reflect a traditional skilled mimicking of equity. For instance, boatmen are Hausas, Birifor and Dagabas who live in the fringe communities of these CREMAs. Tour guides are Wala who leave in the big towns of the CREMAs which are the first point of call by visitors (Sheppard *et al.*, 2010). Rangers of the CREMA are selected throughout the CREMA and its communities include a mixture of the Wala, Dagaaba and Birifor. Additionally, the sustainable livelihoods introduced by the CREMA benefits families in all constituent communities irrespective of their status, (Sheppard *et al.*, 2010).

2.5.8 Economic diversification

The economic baseline of the CREMAs in the Black Volta basin has become more sustainable than ever as a result of the extensive donor base and ongoing aid funding for conservation as well as the increased number of new sources of revenue. It is the case that one improvement in the financial baseline often spurred another (Sheppard *et al.*, 2010). For instance, early borehole development in the Wechiau CREMA led to the need for light, inspiring the solar lighting initiative. Infrastructure improvement opened up doors for the



establishment of the shea cooperative while facilitating the CREMAs ecotourism, a venture that has become sufficiently lucrative to sustainably cater for the CREMA's salaries and other capital needs. The Ecotourism venture has over the years has encouraged and facilitated a growing trade in arts and crafts and foreign visitors have sponsored education development the provision of schools and scholarships (Sheppard *et al.*, 2010).

In the Zukpiri CREMA, the communal spirit in the construction of fire belts inspired the training of Women in solar engineering in India. 2017 provided the CREMA and opportunity to venture into organic Shea and Moringa production, leading to the acquisition of an organic certificate for the CREMA (AgNRM, 2018)

2.5.9 Empowerment

The CREMAs of the basin enjoy considerable autonomy with regard management of their common-pool resources. The CREMA Executive Committee has voting members, with all of them emanating from communities with the CREMAs. The CEC is the highest decision-making body of the CREMA, and its decisions are respected and upheld by the government and law enforcement agencies. Except for Dorimon, all the CREMAs in the basin have received official devolution of authority from the central government. This allows them to make management decisions on the care, protection, and use of their natural resources.

2.5.10 Problem-solving capacity

CREMAs in the basin through careful adoption and implementation of formal and informal problem-solving strategies have succeeded in fostering strong trust networks and acceptable conflict resolution mechanisms. This is evident through the successful implementation of an organic shea cooperative, establishment of VSLA groups and farmer associations, illustration of improvements in local social capital, exposure to participatory decision-making processes and village representation on the CREMA Executive Committee.

CREMAs in the Black Volta Basin has generally succeeded in their strides in sustainable



income generation, creation of employment and the setting up of local institutions responsible for ensuring effective local participation in the management of natural resources and tourism development. (Mbaiwa, 2011).

2.6. Sustainability Indicators for Natural Resources Management under the CREMA mechanism

The philosophy of the CREMA mechanism has it that “When government provide the necessary conditions and incentives, people will manage their resources sustainably” (Wildlife division, 2004). Providing the right condition means the establishment of favourable policies and legislation for biodiversity management while incentives tend to be financial, economic, cultural or tenure related. These incentives are expected to be sustainable and should lead to the sustainable management of the resource base of the CREMAs.

To ascertain the sustainability of CREMAs, the following indicators among others come in handy.

- i. Economics: Dependence on external funding is reduced and, in some cases, not needed.
- ii. Environment: There is effective management and sustainable harvesting of natural resource products.
- iii. Equity: There is the recognition of the importance of equity in the sharing of financial benefits as well as access to natural resources.
- iv. Empowerment: The existing social and organizational capacity of the organization is strong.

2.7. Conceptual Framework

2.7.1 Framework of Three Spheres of Sustainability

This conceptual framework is articulated around the three spheres of sustainable



development: Environment, Economic and Social. These underpin trade-offs between Natural Resources Management and Socio-economic development under the CREMA Mechanism. The framework illustrates the relationship among economic, environmental, and social development in natural resource management and how these relationships influence the sustainability of the economic, environmental, and social development of CREMAs (Figure 1).

Sustainable community-based natural resource management involves lots of inherent complexities, the more reason for which some environmental practitioners are still sceptical about its realisation, after several years of implementation.

Natural resource management decisions made at one time and place affect other places at other times through complex nonlinear and unpredictable linkages (Boyce, 2008), this simplified framework does not address these complexities. It is also recognisable that, achieving conservation and development synergies is constrained by the prevailing economic models that advocate increasing economic growth without regard for a finite natural resource base (Stiglitz, 2006), and the challenging and uncertain effects of global climate change (Parry *et al.*, 2009) on future livelihood systems of society. Nevertheless, it has been argued that tensions between natural resources management and socio-economic development provide opportunities to negotiate trade-offs and identify viable synergies. It is only by accepting and recognising these trade-offs that society can construct a strong foundation towards sustainability (Sunderland *et al.*, 2008, Campbell *et al.*, 2010).

The framework is also aimed at structuring and facilitating the understanding and analysis of the three main pillars of sustainability and how they contribute to the synergistic emergence of the goals of CREMAs in their quest to sustainably manage natural resources while providing better standards of living for their constituents.



The goals of sustainable natural resource management (NRM) are at the core of the overlap (Romero *et al.*, 2012) between the three spheres. The interest projected herein is to learn about and justify the ability of Natural Resource Management strategies such as the CREMA mechanism in Ghana to generate a balance in ecological, economic, and social sustainability.

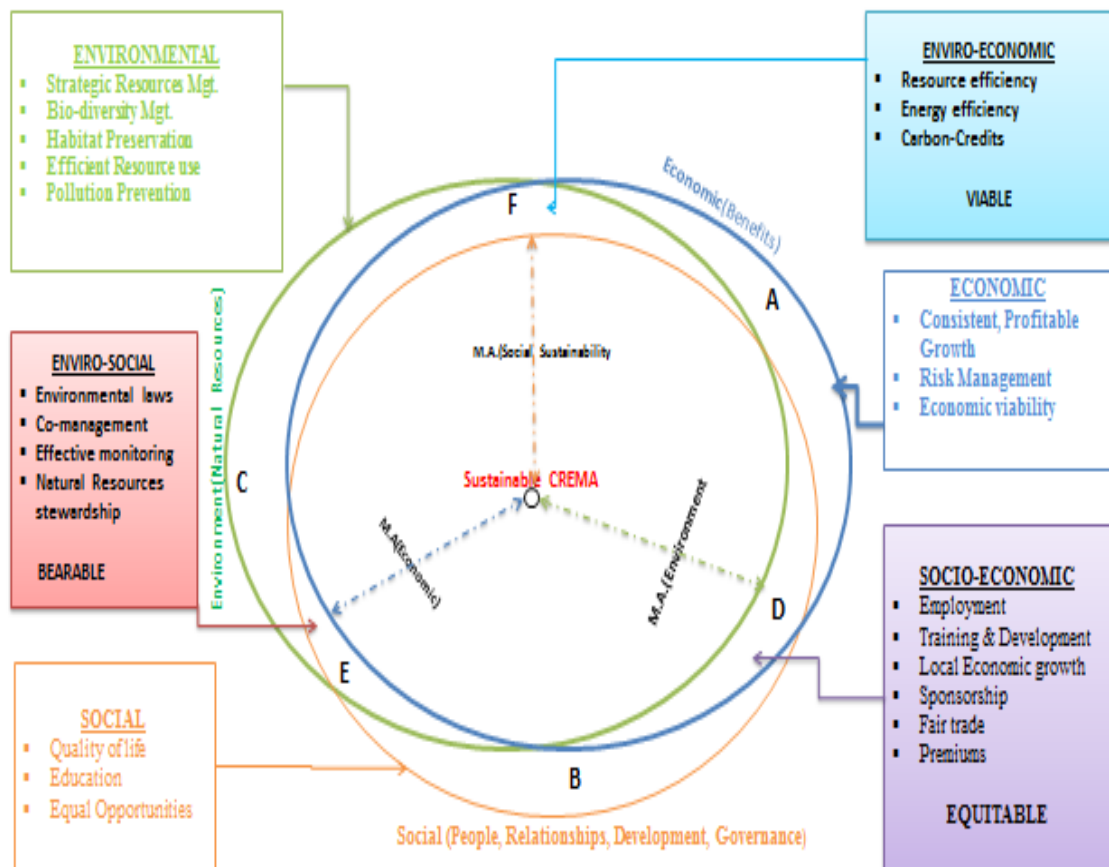


Figure 1: Conceptual Framework of the three Spheres of Sustainability

Source: Purvis et al (2019)

“A” represents the economic sustainability (blue sphere) component of the CREMA with economic growth and viability, consistent profits, and economic risk management as potential results from management action in the sector

“B” represents the social sustainability component (orange sphere) with a focus on people, partnership, development, governance, and political will.



“C” is the environmental component (green sphere) with a focus on strategic resources management, biodiversity conservation, habitat preservation, pollution prevention and efficient resource use.

“M.A” represents management action, which when well-tailored will result in the realisation of the potential contribution to the overall sustainability of the CREMAs from tradeoffs emerging from the integration of and interaction between the spheres.

“D” represents the tradeoffs from the interaction of the social and economic spheres.

“E” are the tradeoffs from the interaction between the social and environmental spheres.

“F” represents the tradeoffs from the interaction between the environmental and economic.

Sustainable development as adopted in global environmental protection initiatives seeks to reconcile the social, environmental, and economic elements of development in the now and into the future. It adopts a global perspective in this regard (Baker, 2006). The model indicates that: environmental stresses are linked with one another with other elements, that is;

- environmental stresses and patterns of economic and social development are linked with one another. Also,
- environmental and economic problems are linked with social constraints.

The model, therefore, strives to ensure social equity, economic efficiency and environmental sustainability by interlinking the society, the economy and the environment. (Baker, 2006).

Achieving success in sustainability thus entails monitoring and improving both ecosystem and human well-being and not any none at the expense of the other. It is practically difficult to develop a project that effectively strives for a balance between the three or operates in equilibrium in that regard. For that matter, the model operates on tradeoffs amongst the three



elements concerned. The idea, therefore, emphasises the interdependence that exist between the people and the surrounding world (Deakin *et al.*, 2019).

Sustainable development and the CREMA mechanism are interlinked. CREMAs have twin objectives of

- Effective conservation of natural resources
- and
- improving rural livelihoods through benefits from sustainable natural resource management.

The sustainability concept is of importance to the CREMA mechanism, as it has the potential to ultimately influence the way communities act and think towards natural resources, leading to effective management and control of natural resource use. (Aslin *et al.*, 2009).

Furthermore, there is strong advocacy for human empowerment and violence-free use of natural resources by both concepts of sustainable development and community based natural resources management. And this can be realised if there is a free and effective flow of information to eradicate ignorance, poverty, and any aspects of discrimination. The CREMA mechanism has a strong connection to poverty alleviation (Dressler and Büscher, 2008), in that it, provides rural communities with much of the required income for the improvement of their livelihoods (Hoole and Berkes, 2010). Active local participation is one effective way of attaining human empowerment as is advocated by the CREMA mechanism. This is in line with the sustainable development sphere of social equity, which places much importance on effective community participation.



The social development Sphere and sustainability

The social development sphere represented by the orange sphere and designated “B”, is one of the main pillars of sustainability which essentially implies the strengthening of already existing and building new social organisations engaged in the planning and implementation of development projects. A community can develop processes and structures which not only meet the needs of its current members but also support the ability of future generations to maintain a healthy community. Social sustainability is that aspect of sustainability or sustainable development which encompasses human rights, labour rights, and corporate governance. In common with environmental sustainability, social sustainability is the idea that future generations should have the same or greater access to social resources as the current generation, while there should also be equal access to social resources within the current generation. Social resources include unrestricted access to quality living standards, good quality education and equal access to social opportunities as well as basic human rights.

Also, we can speak of Sustainable Human Development that can be seen as a development that promotes the capabilities of present people without compromising the capabilities of future generations. In the human development paradigm, the environment and natural resources should constitute a means of achieving better standards of living just as income represents a means of increasing social expenditure and, in the end, well-being.

Furthermore, social sustainability is based on the concept that a decision or project promotes the betterment of society. In general, future generations should have the same or greater quality of life benefits as the current generation does.

Attaining social sustainability requires that, people have improved standards of living, equal opportunities, and effective representation through the introduction of effective social



relationships and strong institutional arrangements as well as Community Development through the creation and availability of jobs and access to quality education. Improvement of Governance at the local level is very essential in ensuring social sustainability and incentivising communities' approaches to sustainable natural resource management. Failure to emphasize the social part of decision or action can result in the slow collapse of the sustainability spheres

Environmental development and sustainability represented by the green sphere and labelled "C" is the second of the three sustainability spheres, and borders on ensuring strategic Natural Resource Management, effective Biodiversity conservation, Habitat preservation, Environmental protection, pollution prevention and efficient resource use. In a truly sustainable environment, an ecosystem would maintain populations, biodiversity, and overall functionality over an extended period.

Ideally, decisions and actions that are made or taken by management should promote equilibrium within our natural systems and seek to encourage positive social and economic growth. Unnecessary disturbances to the environment should be avoided as much as possible. If there is a disturbance, it should be mitigated to the maximum practicable extent to ensure the attainment of an efficiently thriving ecosystem.

In the attainment of ecological efficiency, natural resource use should be within acceptable limits. Likewise, the exploitation and use of renewable natural resources should reach levels that compromise their regeneration capacity. The atmosphere, water bodies and large areas of soil should not exceed their absorptive limits as regards wastes of all kinds generated from the development process (Shmidheiny, 1992). The contribution of environmental sustainability to the sustainable development of projects is embedded in the following strategies (Baker, 2006):



- encouraging the integration of ecological consideration into economic and sector development policies.
- devising anticipatory preventive strategies for development; and
- demonstrating that sound ecological policies also benefit socio-economic development.

Environmental sustainability can therefore be maintained jointly with efforts to attain socio-economic development (Baker, 2006).

Economic development and sustainability which is the third sphere, represented by the blue sphere and designated “A” in Figure1 above, is concerned with the optimal use of natural resources to meet human intergenerational needs (Baker, 2006) while generating economic growth. Emphasis is placed on the use of assimilative capacity, science and technology and institutional arrangements in the utilisation of natural resources, as is the case with CREMAs (Baker, 2006). Economic sustainability in this regard refers to practices that support long-term economic growth without negatively impacting the social, environmental, and cultural aspects of the community.

Similar to environmental sustainability, economic sustainability involves creating economic value out of whatever project or decision is being undertaken. Economic sustainability means that decisions are made in the most equitable and fiscally sound way possible while considering the other aspects of sustainability. In most cases, projects and decisions must be made with the long-term benefits in mind, rather than just the short-term benefits, while appreciating that when only the economic aspects of something are considered, it may not necessarily promote true sustainability.

For many people in the business world, economic sustainability or growth is their main



focus. On the large scale (globally or even locally), this narrow-minded approach to projects can ultimately lead to unsatisfactory results. However, when good economic practices are combined with the social and environmental aspects of sustainability, you can still have a positive result that is for the greater good of humanity.

Interaction of spheres

Social sustainability, Economic sustainability and Environmental sustainability are fundamental to the overall sustainability of CREMAs. CREMAs, therefore, have to demonstrate that these individual components of sustainability could be maintained in partnership; and this partnership involves weighing the economic costs of damage to ecosystems and the benefits which could be attained from conserving the ecosystems, and this is in line with the CREMA Mechanism (Baker, 2006). As presented in Figure 1 above, these different scopes of sustainability are easily studied and data on them gathered separately. There is vast data and publication on social sustainability as there is on economic and environment as separate entities. Under the CREMA mechanism, however, there emerges a continuous effort at adopting multi-criteria techniques and approaches that provides a platform for the interaction of these sustainability components to generate trade-offs between them as a way of realising tangible benefits and effective conservation of natural resources. These trade-offs exist as a result of management actions undertaken by the leadership of the various governance levels espoused by the CREMA mechanism. These actions by management are strongly dependent on economic, environmental, and social objectives often driven by the vision or goal for the establishment of the CREMA.

The interaction between Environmental sustainability “C” and Economic sustainability “A” results in a compromise of a number of the sole benefits of each through the introduction of limitations to exploitation and production to generate trade-offs “F” that ensures resource



efficiency, energy efficiency and carbon credits. These trade-offs, which arise as positive externalities of the management actions employed through simultaneous environmental and economic decisions, ensure a viable situation where the compromises of the Enviro-Economic interaction results in the sustainability of the said trade-offs and eventually contribute to the overall sustainability of the CREMA landscape in terms of enhanced conservation, natural resources management and improved livelihoods.

Economic sustainability “A” interacts with Social sustainable “B” as illustrated by the overlap between the two representative spheres. This interaction results in Socio-Economic trade-offs “D”, that include, but are not limited to increased employment opportunities for members of CREMA constituent communities, Capacity building/training and development, local economic growth, increased sponsorship, and funding for sustainable interventions, as well as fair-trade and other, deserved premiums.

Interaction between Environmental sustainability “C” and social sustainability “B” results in some trade-offs. These include a bearable atmosphere of; - increased stewardship of natural resources among constituent communities, - effective monitoring of biodiversity, - social safeguards - adoption of co-management through consensus building as well as sharing of roles and responsibilities by management and fringe/constituent communities.

Consistent implementation of the right environmental, economic, and social objectives by management at all levels of the CREMA, intensifies the interactions between the three sustainability spheres. This interaction results in increases in tradeoffs as well as their sustainability. As trade-offs become more sustainable through the intensification of the interactions, the overall sustainability space, which encompasses the overlap of all three spheres widens. An indication that the CREMA is attaining a sustainable status in all aspects of its operations.



The purpose of this literature review is to understand and bring to light effort made historically through study and researcher at finding appropriate approaches to the sustainable management of natural resources and settling the debate on which approach is most likely to ensure proper natural resources management as all approaches including the community-based approach comes with peculiar challenges. It is clear from the review that Most literature found was on the history of the different approaches, their progress and successes made, as well as failures encountered. There is the need for further research on the situation under which new approaches to natural resources management can be sustainable.



CHAPTER THREE

3.0 Research Methodology

3.1 Study site

The study was conducted in the three CREMAs of the Black Volta basin of Ghana which covers an area of about 18,384 km² constituting 14% of the entire basin. Politically, the basin covers 26 districts in Ghana. The Upper West Region (UWR) is about 8,370km² in the Basin and makes up about 6% of the basin & 42% of the portion in Ghana (Barry *et al.*, 2005). It is located within latitude 9°35'00''N and 11° 00'00''N and longitude 1°25'00''W and 2°50' 00'' W and houses the Wechiau, Dorimon Paramountcy and Zupkiri CREMAs located in the Wa West and Nadowli-Kaleo districts of the Upper West Region (Figure 2).

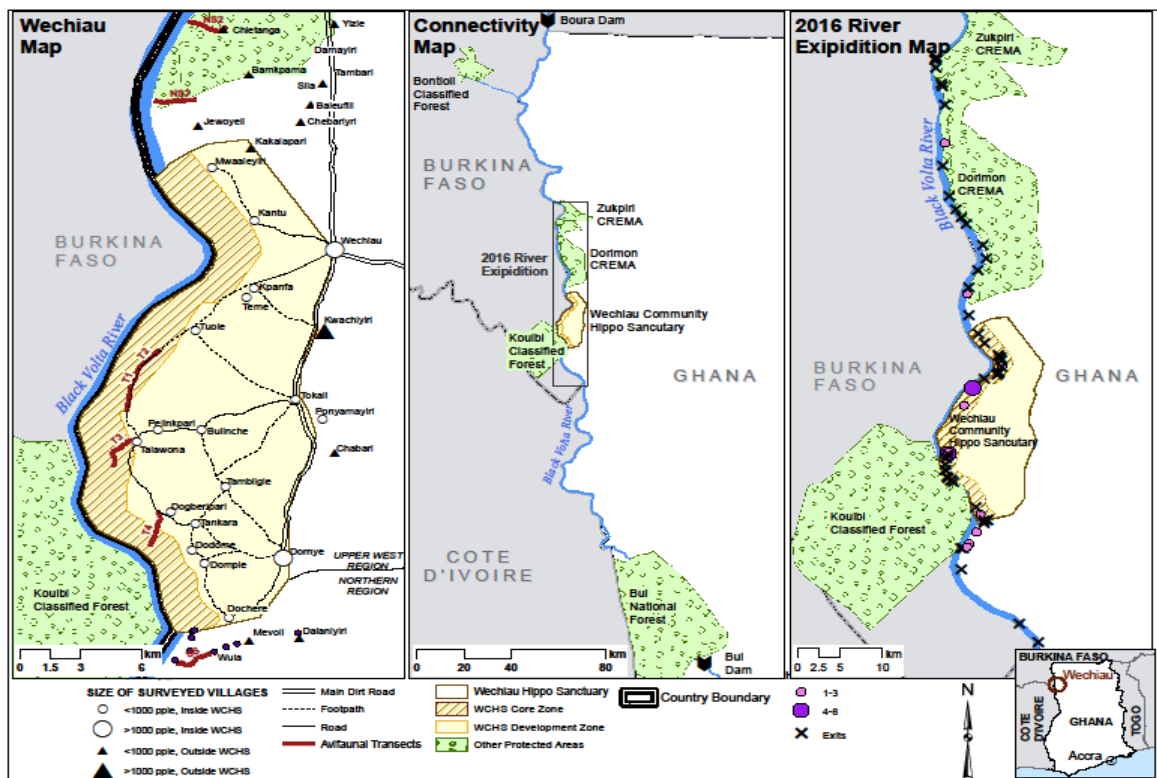


Figure 2: Map of the three CREMAs of the Black Volta Basin
 Source : Bricchieri-Colombi *et al.* (2018)

The first CREMA, the Wechiau Community Hippo Sanctuary, is a 2400 hectares community Protected area that incorporates 34 km of the Black Volta River, housing one of only two remaining populations of the common hippopotamus (*Hippopotamus amphibius*) in Ghana (Sheppard *et al.*, 2010). Its climate is tropical, with daytime temperatures more than 30°C and a single rainy season.

The Sanctuary was created in 1998 by the Paramount Chief of the Wechiau Traditional Area and his sub-chiefs. These community leaders rejected proposals by Ghana Wildlife Division to establish a government-run hippopotamus reserve in the area for fear of losing their land (Asase *et al.*, 2006; Sheppard *et al.*, 2010).

The Sanctuary which was formerly devolved in 2010 has its objectives as the prevention of further habitat degradation, restoration of habitat and recovering of wildlife, ensuring community participation in decision-making, the establishment of livelihood alternatives and facilitation of knowledge dissemination (Sheppard *et al.*, 2010).

The Sanctuary is zone into core and development zones. The core zone is protected through prohibitions on farming, bush-burning, hunting, the cutting of trees and vehicle access, as well as restrictions on fishing, oyster collection, livestock and the harvest of shea nuts (*Vitellaria paradoxa*) and locust bean (*Parkia filicide*) (Earthwatch Institute, 2007). The adjacent, 5–10 km wide development zone consists of wooded savannah interspersed with human settlements and farmland. The sanctuary is made up of 20 communities comprising four ethnic groups, each with distinct languages, namely Wala, Birifor, Hausa and Dagaaba (Sheppard *et al.*, 2010).

The second CREMA is the Zukpiri CREMA, a 4000 hectors management area located along a section of Ghana's border with Burkina Faso. It lies in the Guinea savannah woodland ecosystem, in the Upper West Region of the country, and is situated just east of the Black



Volta River Land is communally owned, although there are several plots managed directly by families and clans (AROCHA, 2010). The establishment of Zukpiri CREMA was initiated by the Zintang Healers Association, a local traditional healers' association (AROCHA, 2010) The CREMA's primary objective is to conserve and improve traditional medicine sources. Zukpiri received its official certificate of devolution in 2011. 16 constituent communities are participating in the Zukpiri CREMA, predominantly composed of subsistence farmers, who also use the area to rear livestock, hunt, and gather wild fruits and other non-timber forest products (AROCHA, 2010.).

The Dorimon Paramountcy CREMA's establishment began in 2016 making it the youngest of the three CREMAs in the Black Volta basin located between the Wechiau Community Hippopotamus Sanctuary and the Zukpiri CREMAs. It comprises a total of 31 communities all of which are under the Dorimon Paramountcy to ensure positive and sustainable environmental practices as well as create economic opportunities through the spirit of togetherness. (AgNRM, 2017).

These three CREMAs were chosen as case study areas, first on a logistical level as they prove more feasible than other areas. Despite having similar histories and characteristics as listed below, they are at different stages of development.

The Wechiau Community Hippo Sanctuary and the Zukpiri CREMAs are renowned for having considerably different levels of success,

They share several characteristics such as,

- Gained Appropriate Authority within a few years of each other (2010 and 2011 respectively)
- Have populations derived mainly from minority tribes with a history of



displacement?

- Are both recognised as being areas with high economic potential from CREMA
- Are all located in the same agro-ecological zone, with similar associated problems

3.2 Research design

A research design is a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research. It is that guide or arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Creswell, 2009).

The study adopted a mixed-methods approach of research design. The mixed methods research design is a procedure applying both qualitative and quantitative research methods in a single study to understand a research problem (Creswell and Plano, 2011). The choice of the design is intended to provide a better understanding of the research problem in a way that cannot be provided by either only qualitative or quantitative methods as explained by Creswell (2009) that mixed methods provide a more complete understanding of the study than either quantitative or qualitative alone.

This study on the sustainability of CREMAs in the Black Volta deals with parameters that cut across various areas, requiring the combination of both qualitative and quantitative methods.

In this study, the mixed-method design relied on both primary and secondary data collected through interviews, focus group discussions, field measurements, field surveys and monitoring, the study of existing documents, reports and internet search.

3.3. Sample Size and Sampling Techniques

The selection of communities for the socio-economic study was done using the purposive



quota sampling technique because quotas were taken from each of the communities in the three CREMAs. Three fringe communities: 1 upstream, 1 midstream and one downstream in each CREMA was purposively chosen based on proximity to the core/riparian zone, based on accessibility and location. A total of five households were randomly selected from each community and their heads were interviewed. Expert sampling which according to Anol (2014) is a technique where respondents are chosen in a non-random manner based on their expertise on the phenomenon being studied was used to select the CREMA executives, patrons, staff, women group leaders, Herbalist, wildlife trackers and officials of partner organisations to the CREMAs. This technique is adopted because the study units from these categories were relevant for the study and some might be left out if a random sampling method was to be used.

Systematic sampling was used for biophysical surveys involving the establishment of transect lines for hippopotami and birds and plot/quadrats for vegetation. Many natural populations exhibit an aggregated spatial distribution pattern (Willoughby 1993). This means that nearby units tend to be similar to each other. Using the systematic sample, the sampling units are spaced far enough apart to reduce this correlation, the systematic sample tended to furnish a better average and smaller standard error than in the case with a random sample, because with a completely random sample one is more likely to end up with at least some sampling units close together (Willoughby 1993).

3.4 Data collection

The data collection methods for the primary data involved:

1. Survey and monitory of biophysical data in the core conservation/riparian zones of the target CREMAs, Data collected included hippopotami population, avifaunal diversity and abundance, floral diversity and abundance (Vegetation analysis) and



habitat condition.

2. Interview to collect socio-economic data in the fringe communities of the development zones of the CREMAs centred on CREMA structures, governance, benefits, and conflict management.

3.4.1 Socio-economic data

Participatory Rapid Appraisal (PRA) methods were employed to collect primary data on the socio-cultural and economic factors affecting sustainable conservation and livelihoods of the CREMAs. Participatory Rapid Appraisal (PRA) is an interactive data collection process conducted at a community or CREMA level or with a specific community group of interest (Coghlan and Brydon-Miller, 2014). It is applied at the design, early implementation and Evaluation phases of a project cycle or used for environmental and socio-economic research. PRA applied to resource management and conservation initiatives put communities at the centre of the process (Coghlan and Brydon-Miller, 2014).

The PRA methods used to source primary data during the study included semi-structured interviews with key resource persons, in-depth interviews with the patrons, CREMA Executive Committee members, staff and selected community members from selected fringe communities of all the three CREMAs. Focus group discussions were also employed for the collection of primary data centred on the selection of people or beneficiaries of a CREMA initiative.

- **Semi-structured interviews** are those in-depth interviews where the respondents have to answer preset open-ended questions (Corbin and Strauss, 2008). Semi-structured interviews are seen as discussions or conversations involving an interpersonal engagement in which subjects share their experience with the researcher. This tool was used to collect data from community members who live



with and manage the resource.

- **Direct observation**, also known as an observational study, is a method of collecting evaluative information in which the evaluator watches the subject in his or her usual environment without altering that environment (Holmes, 2013). Direct observation for this study involved seeing and recording what is spontaneously happening at the time of collecting data. This technique was used to gather information about the vegetation, human activities and physical management practices.
- **Focus group discussion** is a technique where a researcher assembles a group of individuals to discuss a specific topic, aiming to draw from the complex personal experiences, beliefs, perceptions and attitudes of the participants through a moderated interaction (Hayward, Simpson and Wood, 2004). Focus Group Discussions under this study entailed grouping the beneficiaries of livelihood interventions such as members of the Organic shea women group, staff of the CREMAs responsible for ecotourism, conservation, patrolling and awareness creation such as tour guides at different times and facilitating discussions with the help of a guide. This technique provided a platform for in-depth discussions on important issues concerning opinions, attitudes and beliefs that influence individual attitudes to resource management (Nyumba *et al.*, 2018) and use. To allow for group control and effective participation, between six and twelve members were allowed to take part in each focus group discussion. Apart from those held with the shea women cooperatives and the staff of the CREMAs, one focus group discussion was held in each of the sampled fringe communities to validate information gathered earlier through interviews in those communities.

Secondary data refers to data that has already been collected through primary sources for some other purpose and made readily available for other researchers to use for their research



(Allen,2017) Secondary data for this study was sourced from a desktop review of publications and documentation from necessary governmental and non-governmental institutions relevant to the study, such as Wildlife Division of the forestry commission, Ghana Statistical Service, Wa West District Assembly Nadowli-Kaleo District Assembly, Ghana Tourism Authority, AROCHA Ghana, Nature Conservation Research Centre and the Ghana Police Service.

Other sources of secondary data for the study included CREMA maps, statistical survey reports, CREMAs annual reports, and documents compiled by academic and other researchers and the internet.

3.4.2 Biophysical Data

The study covered both flora and fauna. The means of data collection comprised field measurements of parameters (Earth watch Institute, 2007), identification and monitoring of population and diversity of species within the core conservation zones of the three CREMAs. Faunal surveys focused on the Hippopotamus, which is the keystone species in the basin and birds which serve as natural indicators of environmental integrity. (Sheppard *et al.*, 2010)

Data collection on flora focused on plant population and diversity as well as the general biophysical condition of the riverine forest.

3.4.3 Hippopotami monitoring

Monitoring of Hippopotami involved the development of river transects which were used to establish the distribution and abundance of hippopotami in a continuous section of the Black Volta from the southern boundary of Wechiau CREMA to the northern boundary of Zukpiri CREMA (AgNRM, 2017). Surveys were repeated three times in the course of the study. A maximum of four (4) transects were established along the river and monitored concurrently



by locally trained personnel between the hours of 7:00 am and 10:00 am using canoes. (Sheppard *et al.*, 2010)

On each transect, census personnel recorded the number of sighted hippopotami, sex (as possible) and age group (adult/juvenile). Observations were also made of hippopotami exit points. Results of hippopotami sightings and exit points were compiled and averaged (where monitoring was carried out at different times at short intervals). This generated data on the population distribution and abundance of hippopotami within CREMAs.

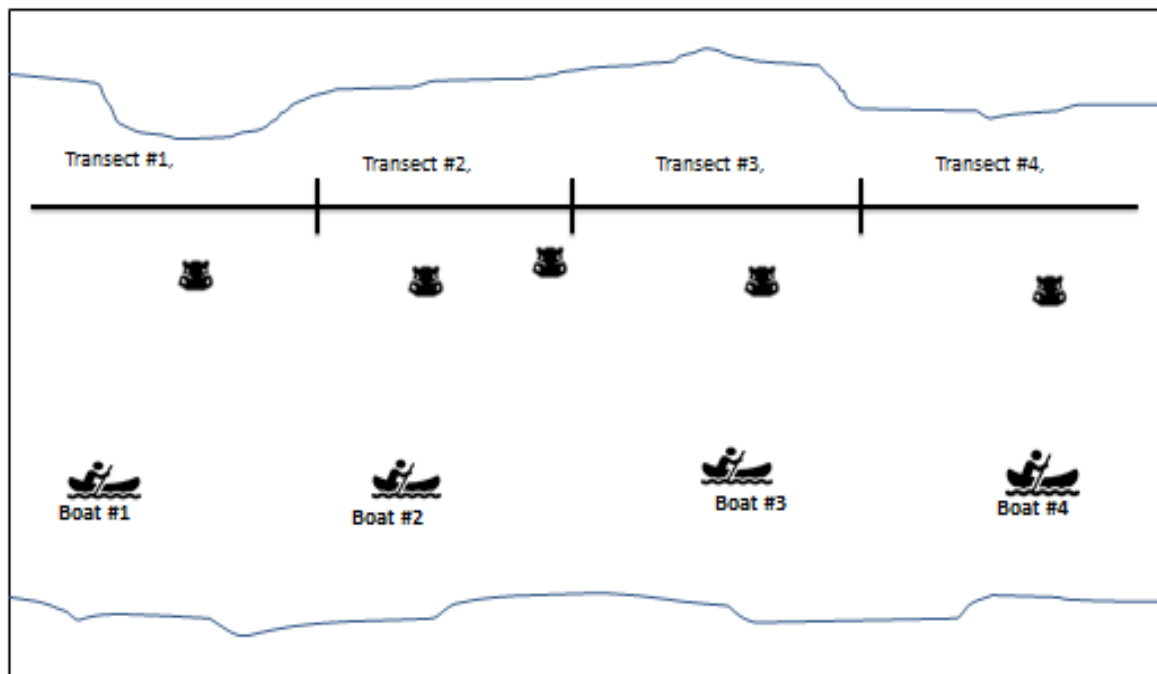


Figure 3: Transects for Hippopotami Monitoring

Source; Researcher's Fieldwork

3.4.4 Bird surveys

This involved the establishment of line transects perpendicular to the river across the entire length of the core zones eastwards (Earth watch Institute, 2007) to measure the diversity (how many different species) and abundance (number of birds of each species) of birds.

A maximum of 5 transects of approximately 2 km length and 10 km spacing were



established throughout each CREMA. Each transect started from the river bank and was divided into segments of approximately 250m (Earth watch Institute, 2007). Each transect was surveyed once a day and two times each year for the duration of the 3 years duration of the study, with observers spending 25 to 30 min on each segment.

Transect walks started at 5:30 am and continued for four (4) hours each day. Recording of birds was done by both direct and indirect observation. Birds sighted either with the naked eye or with the aid of binoculars were recorded (Sheppard *et al.*, 2010). Bird calls were also used to determine species with expert assistance.

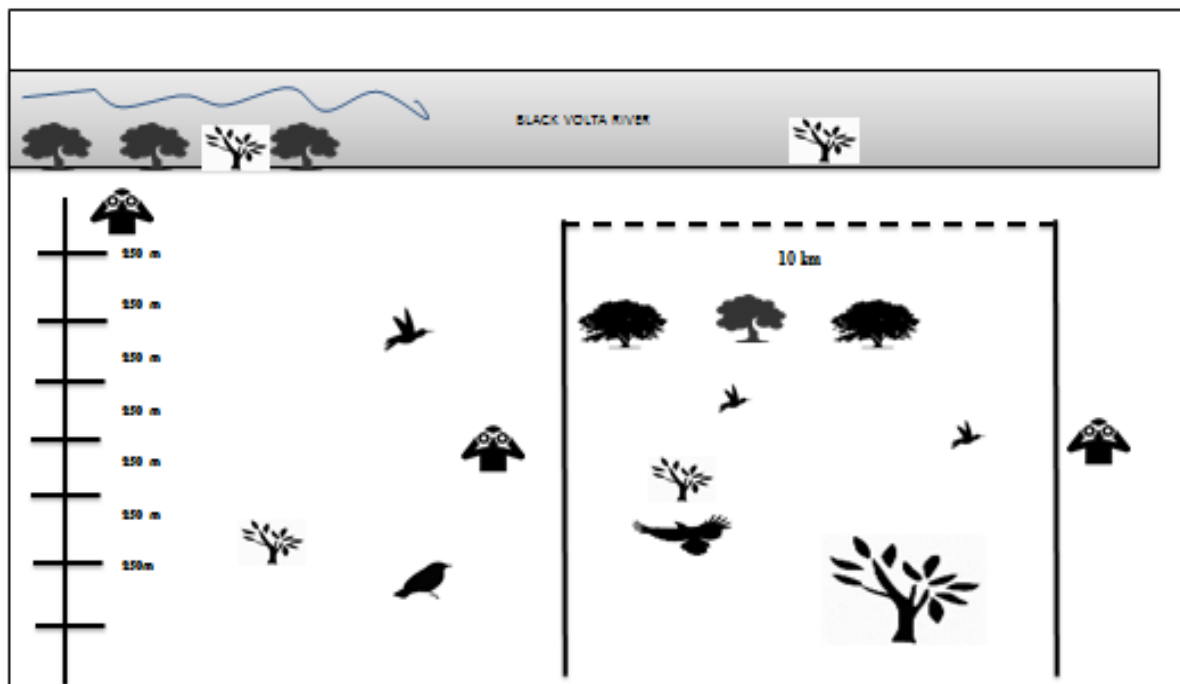


Figure 4: Bird survey Setup by Transects and Segments

Source; Researcher's Fieldwork

3.5 Vegetation surveys

This made use of both social and ecological methods to collect data on floral composition and distribution. The focus was placed on identifying the different tree and plant species (diversity of species), and their abundance (how many of each species are present), as these



defined ground cover to a larger extent and were the most vulnerable to human activities.

Surveys of plant species were made by establishing permanent sample plots within the core/riparian zone of each CREMA. These plots were sampled during the study period and the required data was collected on species, percentage ground cover and stem diameters of wood species.

The Forestry Research Institute of Ghana (FORIG) recommends that 50 m x 50 m (equivalent to 0.5 ha) square plots/quadrats, with three nested plots of 20 m x 20 m laid inside, are set to capture the diversity of tree and plant species and their spread-out nature (Adu-Bredu, 2013).

In the 50 x, 50-metre plot all trees and vegetation that is greater than or equal to 10 cm dbh are identified and measured as recommended by FORIG. In the smaller, 20 m x 20 m plots, trees and shrubs that are 2cm – 10 cm dbh are identified and measured. DBH refers to the diameter of the tree at a person's breast height. (West, 2009)

1m x 1m plots nested in the 5m x 5m plots are used to assess herbaceous or ground cover.

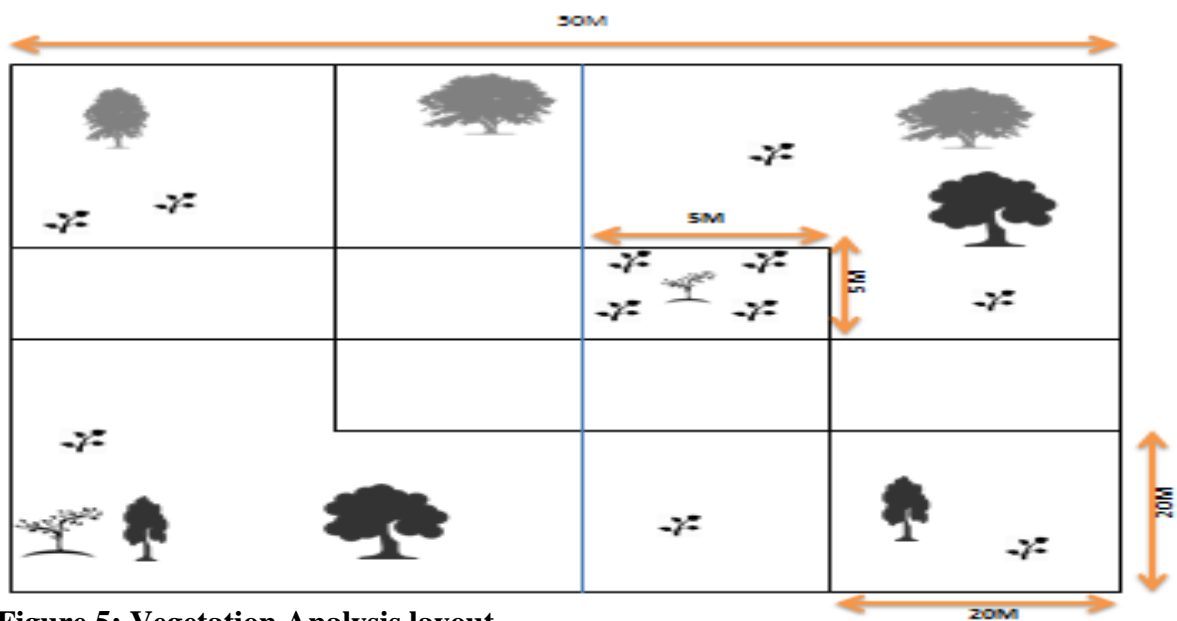


Figure 5: Vegetation Analysis layout

Source: Adapted from FORIG



3.6. Data Processing and Analysis

Data editing is aimed at checking the accuracy and consistency of information on each field survey and interview about the research objectives. The data was edited to ensure that all schedules or sections were completed as required. This is to determine the accuracy, consistency and appropriateness of information.

Data analysis involved the use of Context and Institutional analysis for socioeconomic data and the Simpsons Diversity index for biophysical data.

Context and Institutional analysis refer to analysis that focuses on the political and institutional factors, as well as processes concerning the use of resource in a given setting and how this impact the implementation of resource management project and programmes. (UNDP, 2012).

- **Context analysis** as used in this study, involved examining the historical background, the policy issues and the socio-cultural and economic setting of the CREMA Mechanism. This provided insight into the assumptions concerning the need for intervention and the connection of community participation to the operation of the political system and the creation of social change. Particular attention was given to the unfolding national environmental policy and how it strengthens the decentralisation, devolution and Institutional support for community control of natural resources and use as dictated by the CREMA mechanism.
- **Institutional analysis** in this study adopted an actor-orientated approach to determine the roles, resources and relationships of the various stakeholders involved in the CREMA mechanism. Institutional analysis helps to clarify the political dimensions of the concept and indicates the degree of community representation and control relative to the influence, power or control of the other institutional actors.



- **Simpson's Diversity Index (D)** was used in analyzing the biodiversity data on the avian and plant communities to ascertain the diversity of birds and plants concerning the environmental integrity of the CREMAs in the Basin;

$$D = 1 - \left(\frac{n(n-1)}{N(N-1)} \right)$$

n = total number of organisms of a particular species

N = total number of organisms of all species

The Simpson's Diversity Index considers the number of species present and the relative abundance of each species as well. It has a value range from 0 -1, with 0 representing no diversity while 1 represents infinite diversity.

Data on hippopotami were analyzed based on total observed counts, sex, and age distribution. This was meant to determine the population of hippopotami and the stability trends of the hippopotami populations of CREMAs in the basin.

The number of stems per unit area (stem density), and the summed basal area of each species per unit area (basal area density) were used to describe and compare species composition of plots in each CREMA.



CHAPTER FOUR

4.0 Results and Discussions

4.1 Socio-Demographic Characteristics of Respondents

4.1.1 Sex Distribution of Respondent

The sex distribution of a total of 45 respondents interviewed stood at 39 (86.7%) males and 6 (13.3 %) were females. This is illustrated in figure 4 below.

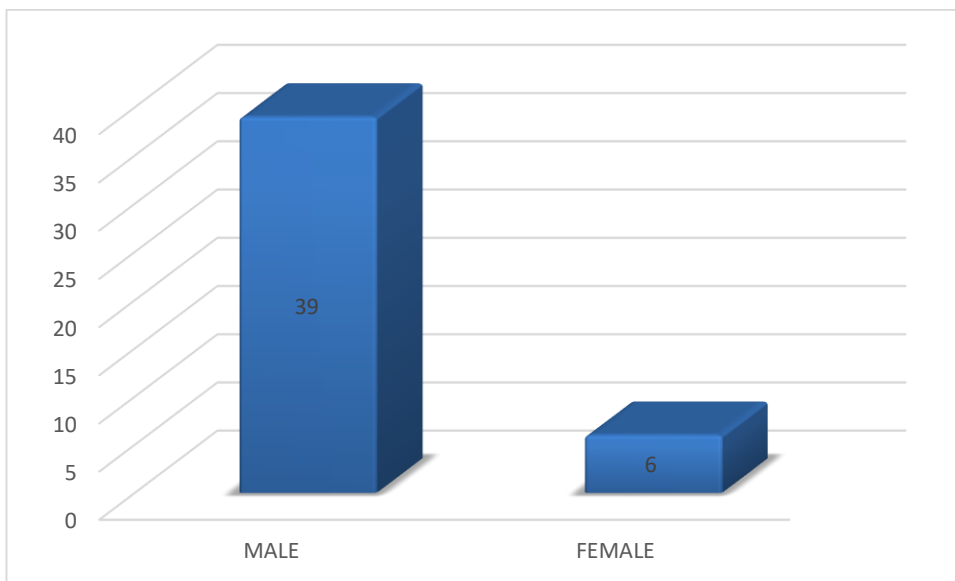


Figure 6: Age distribution of respondents

Source: Researcher's Fieldwork

4.1.2 Age distribution of respondents

In the study, the ages of the respondents ranged between 20-39 years, 40- 59years, 60- 79years, and 80 and above years.

As shown in figure 5, 22.2% were within the age bracket of 20-39, 42.2% within the range of 40-59 and 35.6% of the total respondents with the age range of 60-79. No respondent was aged beyond 79.



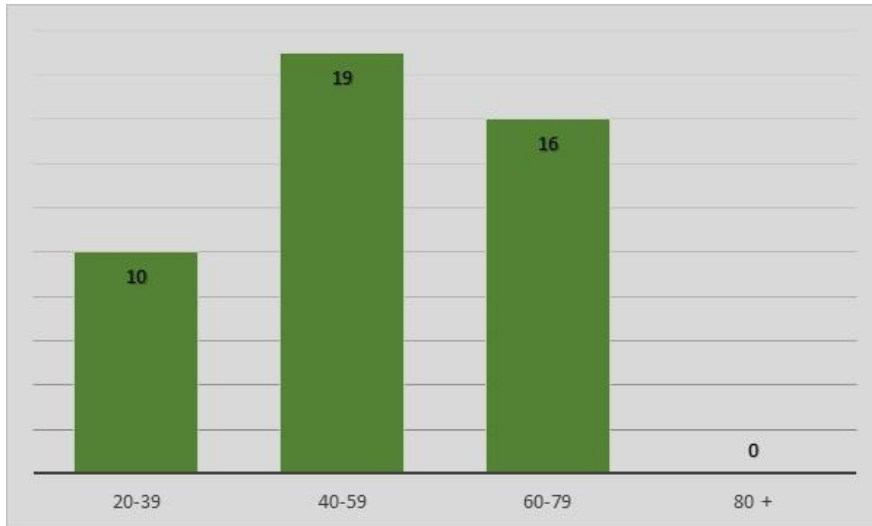


Figure 7: Age distribution of respondents

Source: Researcher's Construct

4.1.3 Level of Formal Education of Respondents

Familiar with rural settings, the majority (80%) of respondents were without any formal education while the remaining 20% attained various levels of formal education.

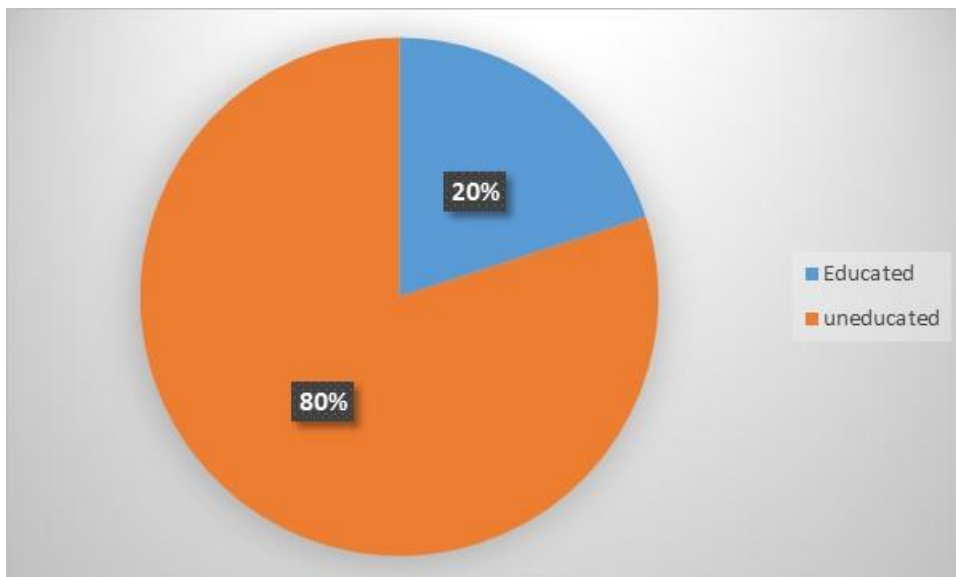


Figure 8: Formal education levels of Respondents

Source: Researcher's Fieldwork



4.1.4 Occupational Distribution of Respondents.

The main occupation of all the respondents is agriculture, mainly food crop production (84.4%). A few of them comprising 15.6% engage in fishing, animal rearing and trading.

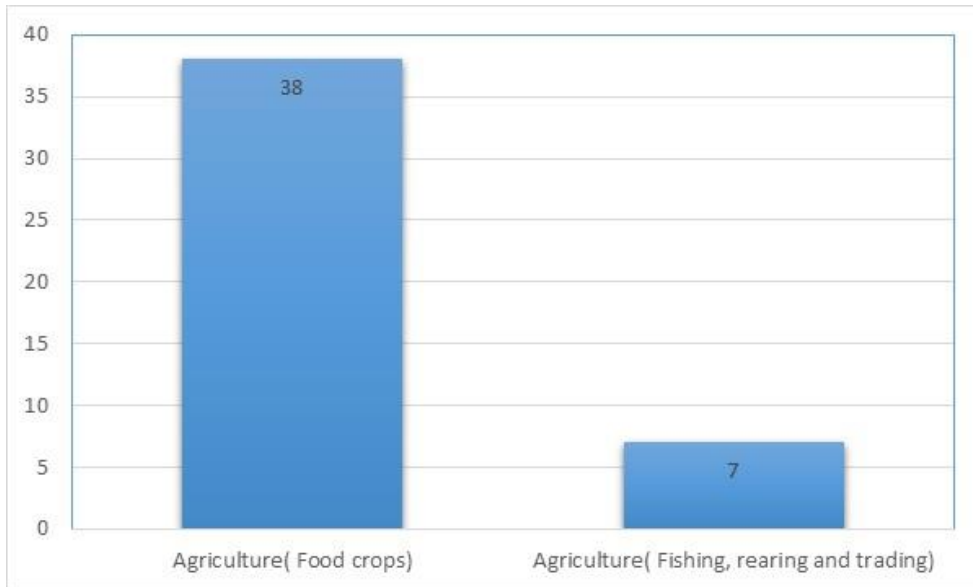


Figure 9: Occupation of Respondents

Source: Researcher's Fieldwork

4.1.5 Marital status

43 respondents out of the total of 45 interviewed, representing 95.6% were all married. Two respondents (4.4%) who bore the least ages of 23 and 26 were unmarried



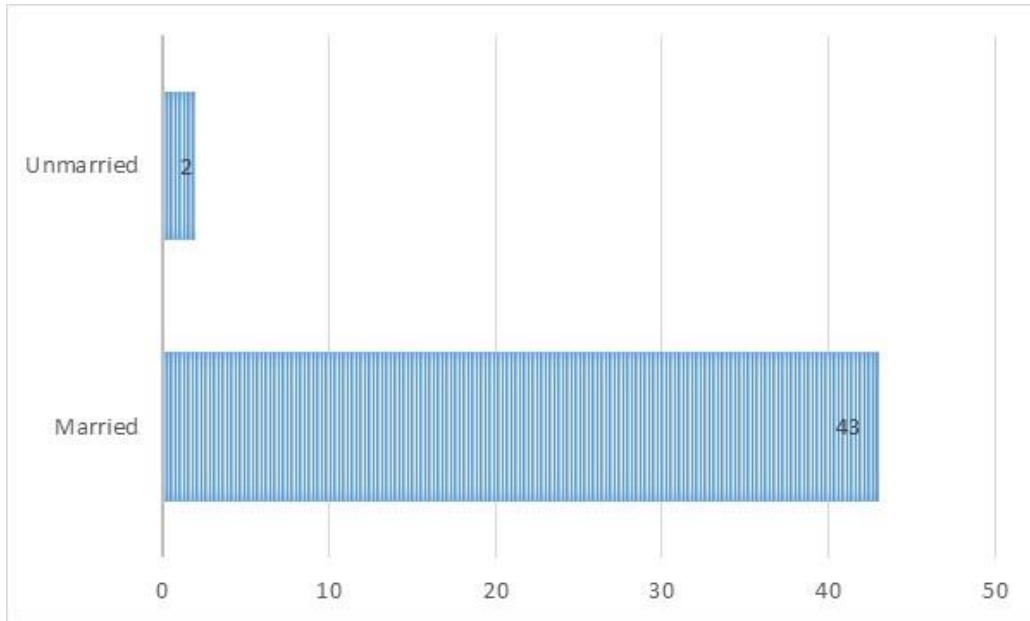


Figure 10: Marital Status distribution of respondents

Source: Researcher's Fieldwork

4.2. Wechiau CREMA

4.2.1. Contribution of CREMA Mechanism to effective conservation and management of Natural Resources

i. Hippopotami

Hippopotami monitoring for 2017 saw a total record of 27 hippopotami for the Wechiau CREMA. The number comprised 10 adult females, 5 adult males, 6 juveniles and 6 unknown individuals as shown in table 1. The majority of 16 hippopotami were recorded from transect one (T1). The distribution of the observations and the performance of transects (especially transect 1) is consistent with records from previous monitoring activities by the CREMA. This is indicative of a possible positive environmental variable within the range of T1 that is encouraging hippopotami patronage of this range.



Table 1: Distribution of Wechiau CREMA Hippopotami by age and sex

Year	Adult Male(s)	Adult Female	Juvenile	Unknown	Total
2017	5	10	6	6	27
2018	9	15	11	1	36
2019	10	8	5	4	27

Source: Researcher's Fieldwork

As displayed in table 1 above, the 2018 survey conducted on Hippopotami in March, produced a total number of 36 individuals constituting, 9 adult males, 15 adult females, 11 juveniles and 1 unknown individual. This observation is higher than that recorded for 2017. The 2018 season figure is by far the highest record available in the CREMA's hippopotami monitoring history. This same figure of 36 was recorded in 2014, which was the first time that hippopotami numbers for the Wechiau CREMA had reached such heights and was attributed to the destruction and altering of hippopotami habitats downstream as a result of the construction of the Bui Hydroelectric Dam (WCHS Annual Report, 2014). There has been a consistent increase in the hippopotami population in the WCHS since its establishment in 1998, from an average of 16 which was recorded in 2000 when the first hippopotami survey was conducted to a current high of 36 for 2018. A total of 27 individuals were recorded in 2019 with a distribution familiar with that of the preceding years. Though the 2019 record represents a slight dip compared to the preceding year, it still stands as a good record to the CREMA but not impressive on a global level and for the fact that the hippopotami are on the IUCN red list (Lindsey, 2015). Figure 6 below presents the historical records of the hippopotami population over the last 17 years of monitoring.



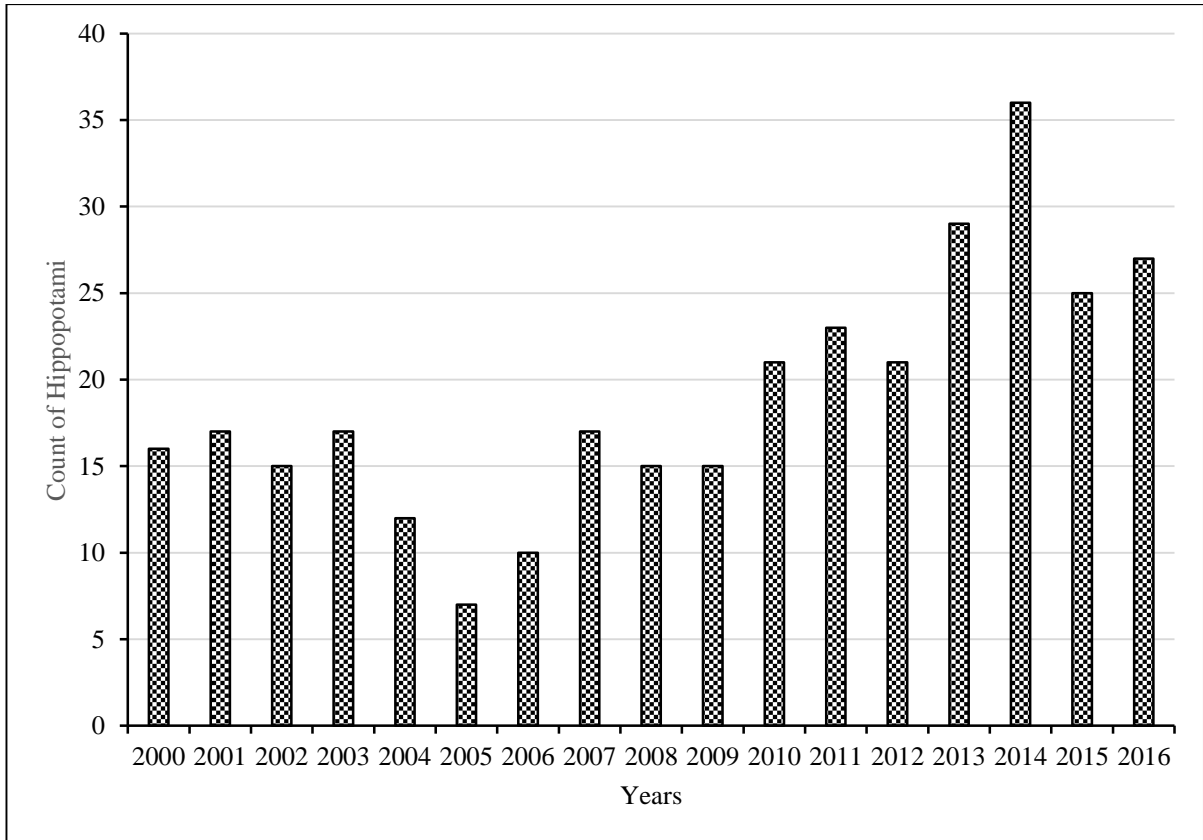


Figure 11: Trend of Hippopotami count from 2000 to 2016

Source: Researcher’s Fieldwork

The consistent increase in the hippopotami population in the Wechiau CREMA paints a blissful picture of the hippopotami community in this stretch considering the trend, the number of females and more especially, of juveniles, as this is indicative of a population with the potential of growth. It is also true according to (Lewison and Oliver, 2008) that with the current population as low as less than 100 hippopotami (in total), random changes in survivability between years could lead to a sharp decrease in sexually viable females. The spread of hippo observations and exits are vital tools in developing further the popular ecotourism industry currently fueling the CREMA’s growth and developmental agenda. Lindsey (2015), observe that hippopotami protection is not only important for the natural environment within the park, but could be used to educate locals on NRM and conservation, and as a way to bring money into the country through ecotourism. This data



will therefore be very useful in siting hippopotami observation stands for tourists as well as conducting river safaris.

ii. Birds

The 2017 Avifaunal survey for the Wechiau Community Hippo Sanctuary revealed a total species richness of 106 birds from six (6) transects. Transect 2(Talawona-Tuole ext) Which lies almost parallel to the Black Volta River recorded the highest number of with 59 different bird species from 172 observations, followed closely by Transect 4(Tankara) with 55 species from 167 observations while T5 (Wula) recorded the least with 48 species from 106 observation. Generally, there was an average of 53 species recorded per transect after surveys were conducted for the 2017 monitoring period.

With regards to species assemblage, it was observed that T2 (Talawona-Tuole ext.) for all surveys conducted differed from all other transects.

Arguably, this stems from the fact that this transect has comparatively undisturbed vegetation because there has been little to no human activities such as settlement or agricultural activities observed on all segments on the transect this is justified by Muhammed and Mohammed (2011) in the conclusion that there was a strong relation between birds' diversity and their habitat is shaped by micro factors such as vegetation cover and structure. The vegetation along transect 2 is largely savanna woodland and runs parallel to the Black Volta River (Sheppard et al 2010).

Avifaunal Diversity trends of the Wechiau CREMA measured using the Simpsons diversity index (SDI) revealed a value of 0.98. This figure gives an indication of a strong Avifaunal diversity for the CREMA for the year 2017, presenting a strong probability that any two individuals selected from the observed population will belong to different species as was equally observed by Bibi and Ali (2013).



The least performed transect for the Wechiau CREMA, T5 wula which lies on the boundary between the Wechiau and Dorimon CREMAs recorded a total of 48 species from the surveys. It however recorded the highest for the Dorimon CREMA with a total of 53 species in the same year. This difference in the performance of the transect for the two CREMAs is attributed to great variations in weather during the various counts, considering heavy mist and intermittently cloudy weather during the Wechiau surveys against generally clear weather during the Dorimon surveys. Also, *figus species* on the transect which were in blossom during the Wechiau surveys were with fruits during the Dorimon survey thereby attracting more birds' patronage. *Ficus* sp commonly known as Weeping figs are trees that attract large numbers of birds whenever they produce figs. (Amar-Singh, 2010).

For the year 2018, a total of 110 species of birds were recorded in 822 observations during the survey period. Transect 2 maintained its position as the transect with the highest number of 62 species recorded from 179 observations while the least performed transect; T1 recorded 48 species with 164 observations. There was an average species of 54 bird species recorded per transect. Simpson's Diversity Index calculated for 2018 is 0.98, similar to the value recorded for the previous year of 2017.

In 2019, a total of 98 species of birds was recorded from 894 observations. The transect with the highest number of species was transect 2 with 65 species from 173 observations; this trend has been consistent for the three years of avifaunal surveys conducted for the CREMA. Second, transect 2 with regards to species diversity is Transect 1 which record the highest observations of 187 with a total of 57species. It was discovered that bird diversity and abundance for the Wechiau community Sanctuary was high in transects that had less disturbed vegetation and low in transects that have encountered some level of disturbance or interference by humans. This difference in habitat quality because of anthropogenic activities offer the best explanation for the divergence of species richness between transects



in the WCHS (Sheppard *et al.*, 2010).

Though the data realised in 2019 presented a lower number of species and observations, the Simpson's diversity index of 0.98 calculated is consistent with previous years and shows a convincing trend that avifaunal diversity in the Wechiau CREMA is strong and with the range of the indices calculated for the site in the years of 2017 and 2018. The average number of species per transect recorded stood at 53species.

Species including Bateleur, Bluethroat, Cardinal woodpecker and purple heron among others were recorded for the first time during the period of the study, thereby increasing the total number of species recorded in the CREMA to 166. Among these new records, only Bateleur has been listed NT while the rest are of least conservation concern according to the IUCN red list criteria. The recording of these species for the first time could according to Muhammed and Mohammed (2011) be attributed to the emergence of favourable vegetation, relative humidity, temperature, ground cover and grasses which provide a variety of flowers and seeds that attract insects which are the main sources of energy for these bird species. A comparison of the total number of species and observations for the three years of the study is illustrated in figure 8 and figure 9 below respectively.



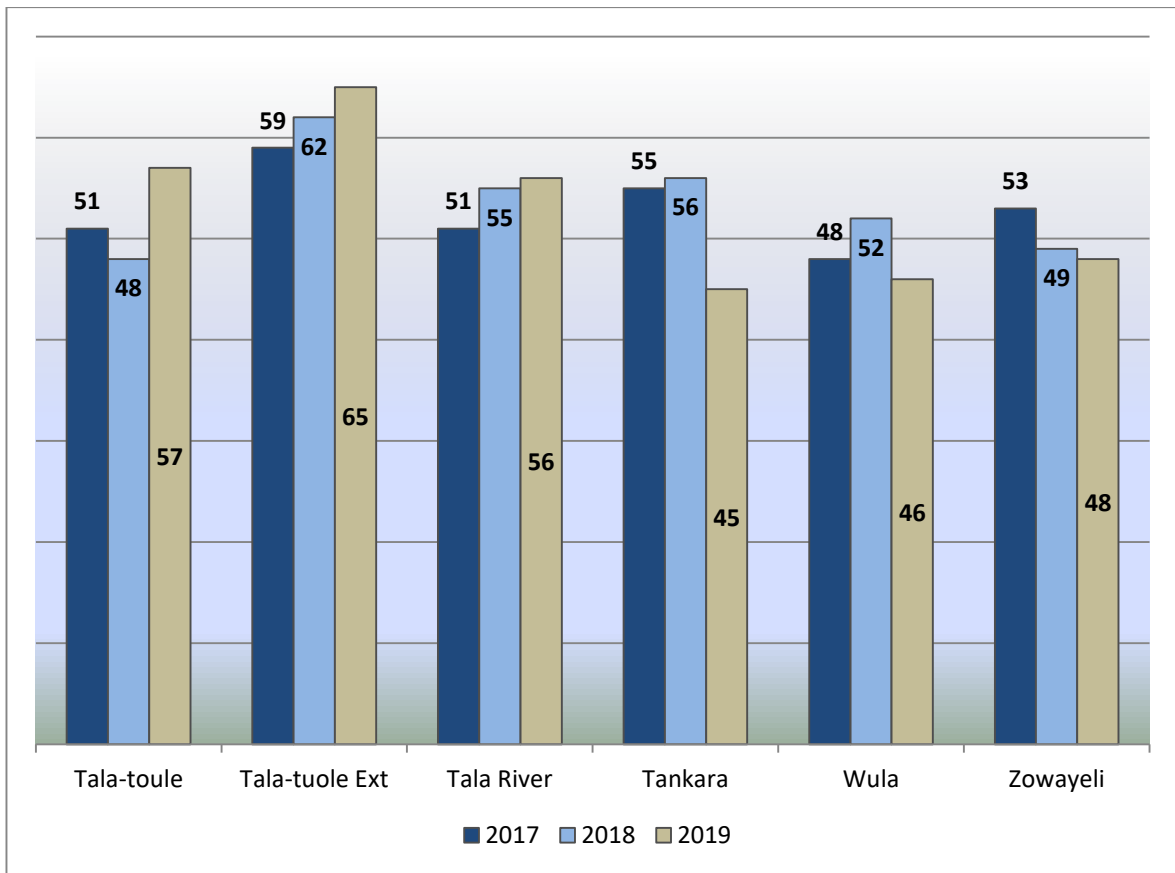


Figure 12: Comparison of the number of Species across different years for the Wechiau CREMA

Source: Researcher's Fieldwork



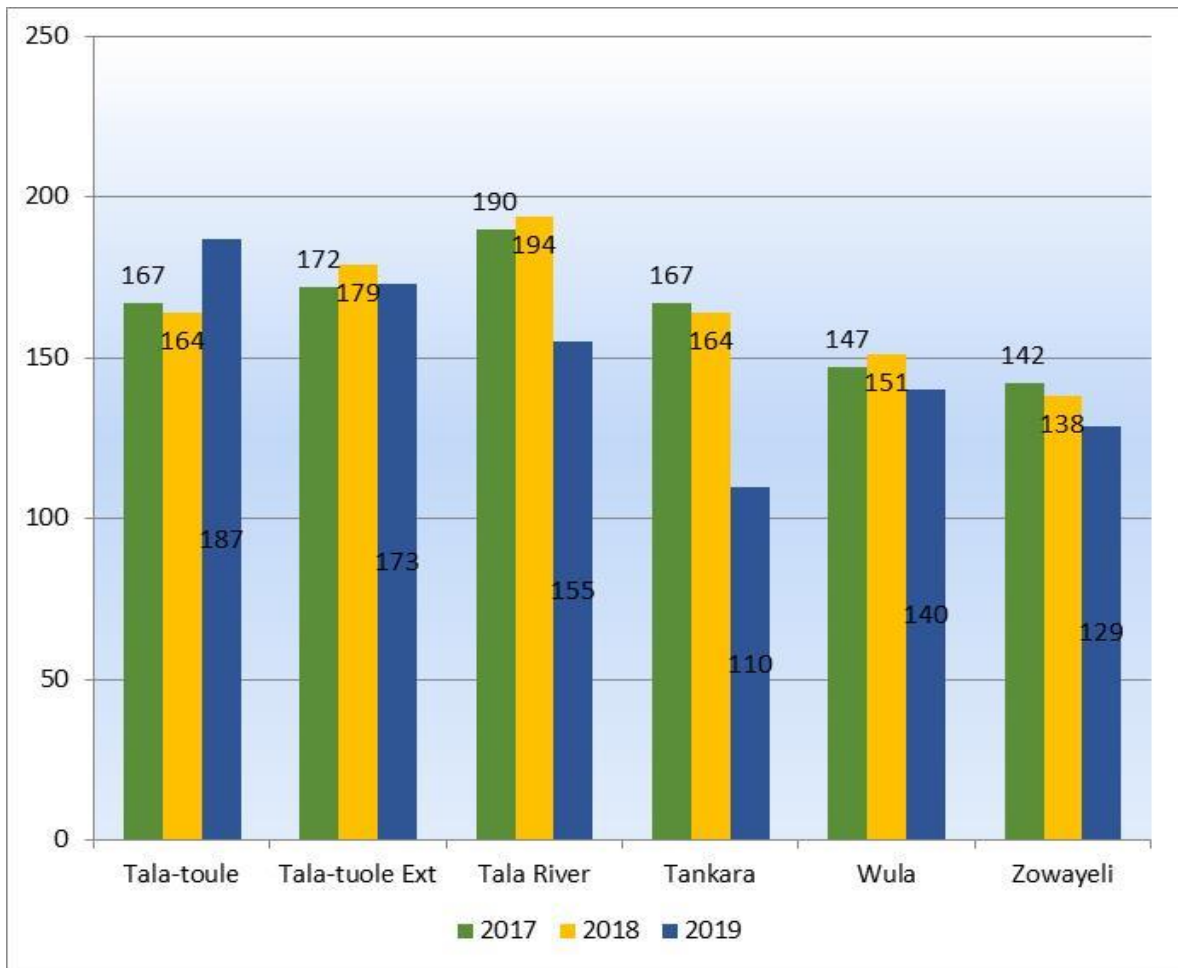


Figure 13: Comparison of the number of birds observed across years for the Wechiau CREMA

Source: Researcher's Fieldwork

T2 (Tala-Tuole ext.) maintained the leading role as the transect with the highest bird species richness in all surveys conducted during the period of study. This observation has been consistent for 2017, 2018 and 2019. This trend of consistency was not so different with the transect having the least species richness. Transect 5 for the three years of the survey continuously recorded the lowest species. A trend attributed to the high level of human interference and the fact that transect 5 is located on the boundary between the Wechiau CREMA and the Dorimon CREMA which was still at its infantile stage and struggling with the enforcement of by-laws that would protect its riparian zones from limitless access. This



is arguably indicative of the positive impact of the Wechiau Community Hippopotamus Sanctuary's conservation efforts on birds' species richness in adjoining areas outside of the CREMA (Sheppard *et al.*, 2010).

iii. Vegetation

The core zone of the three CREMAs where the biophysical data was collected is categorised into three vegetation types based on available conditions. These included

- i. Riverine Forest: This is the vegetation type located at the bank of the. It forms a close canopy with a loose underground. Plant species here are common in the forest zones of Ghana.
- ii. Flood plain: the flood plain is located next to the riverine forest and is usually flooded during the rainy season. Species here are water tolerant with *Mitragyna inermis* being the most dominant.

Guinea Savanna: This vegetation forms the main vegetation type of the core/riparian zone. It is dominated by plant species typical of the savanna zone. Most of the human interference within the core/riparian zone takes place here, as such it has disturbed and undisturbed portions

Out of a total of 1017 individual plants counted in the 9 quadrats laid in the Wechiau CREMA, a total of 41 plant species was identified during the study period; this number is lower than the 210 species that was identified in 2001 by a team of Earth watch researchers. The reason for the drastic reduction in the number of species is partly attributed to the fact that the study was done in the wet season, as such; the riverine forest and the flood plains of the core zone could not be mostly accessed. Secondly, the botanist used for the study generalised species due to his limited expertise.

Simpson's Diversity Index calculated for the CREMAs plant community stood at 0.92. This



is second to that of Zukpiri in the basin. It shows a strong diversity of the plant community and also justifies management's action at conserving the natural resources of the CREMA.

Angiosperms formed the most dominant plant group. The most dominant families included Papilionaceae, Compositae, and Caesalpinaceae (Earthwatch, 2001). The mean number of individual plants for the 9 quadrats was 159 comprising 34 species for the 50mX50m quadrats 288 comprising 15 species for the 20mX20m quadrats and 64 for the 1mX1m nested plots comprising 8 species. All individuals within the 1mX1m quadrats are herbaceous, with relatively good density. *Vitellaria paradoxa* is the most dominant of the species having the highest relative density in all three study quadrats. The mean density of *Vitellaria paradoxa* for the three 50m X 50m stood at 49.87, approximately 50 per cent.

In the 20mX20m quadrat, the species distribution was not so different; *Vitellaria paradoxa* remained the most dominant with the highest relative density followed by *Combretum* spp.

All of the species identified are associated with the Guinea savanna vegetation. The riverine forest and the floodplains of the CREMA were not accessible due to flooding.

The species richness of the CREMA as revealed by the study is unique considering the unfavourable nature of atmospheric conditions of the area. This supports and promotes the diversity of fauna communities within the area (Root-Bernstein and Jens-Christian, 2018) and also affects the microenvironment at various levels. The absence of tree stumps and no observable signs of branch loping is indicative of well-conserved vegetation. Approximately 75% of the species identified in the 50mX50m are fruit-bearing presenting a very positive scenario of continuous regeneration and increment in plant and species population. With such a good individual count of young trees and shrubs in the 20x20 quadrat, there will be but a good stratification of the plant community which will provide habitation for diverse fauna species as supported by Tews *et al.*, (2004), that areas with predominant vegetation



structure create structural diversity essential for a wide array of faunal species groups.

Table 2: Summary of the floristic Composition of the Wechiau CREMA

Plot location	Upstream	Midstream	Downstream
Tree layer ≥ 10 cm DBH			
Number of individuals in 50mX50m	133	177	167
Number of species in 50mX50m	34	21	23
Mean DBH [cm]	24.00	25.33	24.39
Shrub layer < 10 cm DBH and ≥ 1.5 m			
Number of individuals in 20mX20m	131	101	170
Number of species in 20mX20m	12	11	15
Herb layer < 1.5 m			
Number of individuals in 1mX1m	73	70	49
Number of species in 1mX1m	7	8	5

Source: Researcher's Fieldwork



iv. Habitat Condition

Habitat conditions studied along permanent bird transects revealed that Vegetation characteristics along the transects within the CREMAs core zone were generally different from those on transects located outside the CREMA boundaries. Transects within the CREMA were dominated by closed vegetation, including woodland/tree savanna, marshy areas, and riverine forest. On two transects signs of other species were recorded, including hippo footprints, duiker, and the scat of an insectivorous animal. Of critical note, on 2 transects in the CREMA, there were signs of cattle grazing, fuelwood collection, and fishing camps. Along the two transects of the CREMA, the continuous flow of natural vegetation was disrupted by human activities including food crop production, irrigation agriculture on the riverbank, plantations of cashew and teak and fuelwood harvesting. Large sections of these transect are dominated by grass savanna with dispersed woody vegetation and erosion at some sections of the bank. These eroded banks are said to be caused by cattle that access the river for watering.



Plate 1: Eroded River banks and burnt area the Wechiau CREMA.

Source: Researcher's Fieldwork



There was also observation of plantations of cashew (*Anacardium occidentale*) and teak (*Tectona grandis*). Prominent anthropogenic activities include farming, fuelwood harvesting fishing camps (on very few occasions) along the riverbank.

During the 2018 dry season monitoring session, the whole CREMA landscape and beyond was totally gutted by wildfires except for patches of approximately 50m radius in sections of the core zone, and especially within thickets of the riverine forest. Wildfire control can be said to be less prioritised in the CREMA in the past. Sensitisation and resourcing will therefore be significant in turning this faith around. These patches however served biodiversity greatly as activities of rodents and mammals were higher in and around such patches. For instance, signs of wild animals including hippo footprints, duikers, and scat of insectivorous animals (AgNRM, 2018), were recorded not far from two such patches. The first-time record of “blue throat”, a rare bird species in most of its ranges, also occurred in these patches.

Apart from ravaging bushfires, other minor anthropogenic activities including fuelwood harvesting were observant. Other critical human activities that require urgent attention include animal grazing in sections of the core zone which results in trampling and contribute to bushfires and watering of animals in the Black Volta River which contributes greatly to riverbank erosion and riverbed siltation.

4.2.2. Benefits of the CREMA Mechanism to Communities

In pursuance of the philosophy and objectives of the CREMA mechanism, CREMAs in the Black Volta Basin have benefited in terms of financial benefits, employment, livelihoods enhancement, infrastructural development, educational opportunities, and cultural pride among other intangible benefits. This is evident from the responses gathered from key informant interviews, focus group discussions and questionnaires administered to a section



of CREMA stakeholders.

100% of respondents interviewed cited several benefits ranging from financial to community pride. Top among the benefits however include Increase revenues and Revenue sources, Employment, Infrastructure development, educational opportunities, Livelihoods, Relationships, Conservation and Community change.

Interviews conducted with key informants, household heads and from focus group discussions in the Wechiau CREMA revealed several benefits that have so far been realised from the creation of the Wechiau CREMA. Perceived benefits included increased revenues/income, employment, infrastructure development, educational opportunities, ecosystem health, prestige, and pride.

Revenues to CREMA

In a key informant interview with the Manager of the CREMA, He indicated that, Revenue streams for the Wechiau CREMA number five. These include eco-tourism revenues, Revenue from rentals, Donor support, Premiums from NTFP ventures and internal transport service by the CREMA. The Wechiau CREMA in 1999 commenced its ecotourism activities to generate revenue to meet its core objectives of ensuring effective conservation of the hippopotami and other natural resources whiles at the same time providing benefits to constituents of the CREMA. Cash investments into the ecotourism venture were small from start leading to incomes as low as about GHS17.00 (US\$3) in its first year of operation. As cash investments into the sector increased over time, there was a corresponding increase in revenue generation from ecotourism. According to the manager of the Wechiau CREMA in one of the key informant interviews, “a record amount GHS 79,414.00(US\$14439) was realised from ecotourism before foreign tourist visitation was affected drastically by the Ebola pandemic”. The CREMA’s internal and external income streams have increased with time (Sheppard *et al*, 2010) through management action towards financial sustainability and



the CREMA's ability to attract sustained external investment from a variety of donors.

Apart from revenues generated from the ecotourism sector which is mostly used to settle the salaries and stipends of staff and stakeholders, the CREMA has its second stream of income from conservation premiums paid by a concessionaire on organic Shea nuts collected from the organic certified landscapes of the CREMA, the CREMA manager indicated. This premium according to the CEC chairman and CREMA Manager is equivalent to 5% of the price paid for total nuts purchased from the collectors. The CREMA received on average; GHS 14,435.575(US\$2,624.5) annually as a premium from organic Shea collection. These premiums go into a conservation trust fund and use for conservation activities. Another revenue stream of the CREMA according to the Manager includes Fair for Life premium (GHS 80,000(US\$14,545)) from the processing of organic Shea nuts and renting from the CREMA's organic Shea factory. The rent, which is the third income stream to CREMA, started at GHS 12,000.00(US\$ 2181.81) in 2015. According to the CEC Chairman, this rent increase annually by a percentage equal to Ghana's inflation rate for the year in perspective. This brought the rent received by the Wechiau CREMA to an approximated amount of GHS 15,000 (US\$2727) in 2017. This rent is placed in a conservation trust fund just like the organic Shea premiums, from which 10% per cent of the total value of the fund is drawn to undertake conservation activities (60%) and CREMA development activities (40%)

Donor support to the CREMA in its 20 years, according to the manager is more than GHS2,750,000(USD 500,000). This has gone into the provision of scholarships to needy constituents, the building of school infrastructure, provision of potable water to all 21 sanctuary communities, capacity building and logistics for staff among others. The chairman added an internal transport system operated by the Wechiau CREMA though not very viable generates on Average, GHS 10,000 (US\$1818.18) annually according to the CREMA



manager.

Table 3: Revenues and revenue sources of the Wechiau CREMA

YEAR	REVENUE AND SOURCES					Total Revenue
	Ecotourism	Shea factory Rents	Organic Shea Premium	Fair for life Premium	Internal transport	
2010	14,493.50	00	3,650.82	00	00	18,144.32
2011	23,300.00	00	6,728.40	00	3,400	33,428.40
2012	21,561.00	00	8400.75	00	5,240	35,201.75
2013	26,485.80	00	9,150.00	00	00	35,635.80
2014	23,840.00	12,000	10,854.00	00	7,200	53,894.00
2015	15,722.00	13440	9,198.00	00	12,960	51,320.00
2016	23,922.00	14,784	12,750.00	31,000	10,750	93,206.00
2017	40,672.00	15,000	14,435.00	58,947	12,960	142,014.00
2018	39,249.50	16,500	17,100.50	80,114	12,150	165,114.00
2019	75,116.00	17,820	24,000.80	106,000	00.00	222,936.00

Source: WCHS * amounts are in Ghana Cedis (GHS 5.5= USD 1.00)

The financial status of the CREMA is currently sustainable with a trust fund valued at about GHS 275,000 (US\$ 50,000), placing the CREMA in a position of being able to run and meet all its financial needs for at least 10 years with any donor support. (NCRC, 2018).

Employment

On employment, out of 15 respondents interviewed in the Wechiau CREMA, 14 of them representing 93.3% acknowledged employment as the major benefits realised by



constituents of the CREMA since its establishment in 1998.

Employment opportunities availed by the establishment of the CREMA are both permanent and temporal and are available only to individuals from constituent CREMA communities.

In an interview with the manager of the CREMA, he indicated that “The CREMA in the year 2000 commenced its ecotourism operations and employed three permanent staff to the position of Manager, financial secretary, and head tour guide. The number of employees to the ecotourism sector increased to 50 with each employee receiving regular income directly from the CREMA, including five stipend receiving landlords”. He added that among the 50 are 17 full-time employees and about 33 commission receiving staff who work are tour guides, cooks, boatmen, carpenters, dancers among others.

The introduction of an organic shea collection and processing venture by the CREMA led to the creation of new jobs that employed 726 women in 2008 when it was inaugurated. The number of employees to the organic shea collection and processing venture by the CREMA rose to about 1000 in 2009 and currently stands at 2000. According to the manager of the CREMA

The manager who doubles as the financial secretary to the CEC, also stated that incomes accrued by the women employed into the organic venture of the CREMA is estimated at GHS 126,951 for 2008, GHS 190,102 into 2019 and increased consistently to a current value of GHS 380,204 with the commencement of processing of nuts into butter at the CREMA's organic shea factory. The table below gives a breakdown of the employment opportunities linked to the CREMA operations.



Table 4: Employment Breakdown at the Wechiau CREMA

Position	Type of Employment	Number of Beneficiaries
Executive staff	Full time	4
Financial secretary		1
Ranger	Full time	10
Caretaker at tourist lodge	Full time	1
Registered shea collectors and processors	Full time	2055
Tour guide	Commissioned	7-10
Boatman	Commissioned	10-15
Cook	Commissioned	4-6
Household cultural tour guide	Commissioned	6-8
Carpenter	Occasional	2
Mason	Occasional	2
Dancer	Occasional	60- 100

Source: Wechiau Community Hippo Sanctuary

Infrastructural Development

Infrastructural development was beneficial as was cited by 66.7% of respondents and was ranked second in all focus group discussions held in the CREMA. This according to the CREMA manager comes in the provision of boreholes, construction of school buildings, lodges, dugouts and reshaping or roads within the CREMA. Infrastructure development in the CREMA between 1999 and 2007 occurred faster within the CREMA than in



communities outside its boundaries (Sheppard et al, 2010). Though at a slower pace, communities within the CREMA still experienced faster development compared to communities outside of the CREMA, asserted the CEC chairman. According to the CEC chairman, all 21 CREMA communities which were without portable before 2000 can now boast of at least a borehole each. According to a respondent during focus group discussion in Talawonaa, “this community of ours have been provided with two boreholes which are not adequate because we are many, making some of us to still go through the core zone to the river for water”

In a focus group discussion with staff of the CREMA, the head tour guide indicated that “The CREMA through support from Calgary Zoo of Canada, has built two schools in the communities of Talawona and Kantu to improve access to education for children of school-going age in the CREMA. This the manager said has lived up to expectations, adding, “Our last visit to those schools has shown increases in enrollment with most of the pupils coming from the CREMA constituent communities.

Other infrastructures provided through the CREMA according to the CREMA chairman include the construction of a dugout at Dogberipari for the watering of animals and gravelling of the three-kilometre Talawona-Dogbrepari road to ease movement of people, goods, and services between the communities and with the district capital.

The provision of 546 solar-powered LED lighting systems to households in 17 CREMA communities was cited by a ranger during a focused group discussion. This was backed by the CEC chairman when he said that “these communities became “the light in the dark”, as no other community outside of the CREMA was with light”.

Other Benefits

The CEC Chairman of the Wechiau CREMA during a key informant interview emphasized that A scholarship scheme established by the management of the CREMA has between 2010



and 2018 provided full scholar to over 50 needy but brilliant graduates from the Junior High schools with the CREMA. Other benefits cited during a focus group discussion with women of the organic shea cooperative included the improved household income, improved vegetation and soil fertility, increased visitation to the community by foreigners, and increased cultural pride. A respondent during the focus group women farmers of the Shea cooperative said she now resort mainly to organic fertilizer because the fertility of the soil has gotten much better.

4.2.2.1. Benefit Sharing

The study revealed that the Wechiau CREMA has no comprehensive benefit-sharing plan. According to the CEC Chairman, half of the revenue of the CREMA goes into a conservation trust fund to be used for conservation-related activities and some pressing CREMA needs. He added that the use and distribution of money drawn from the trust fund is determined by a tripartite committee with representatives from the CREMA, SFC and NCRC. The remaining revenues and other benefits to the CREMA are shared based on the prioritisation of the needs of the constituent communities and households.

The absence of clearly documented criterion for the benefit sharing stifles the CREMAs quest for sustainability, the chairman stressed, this assertion of the chairman is supported by Jones (2006) when he argued that; “revenue distribution needs to be based on a carefully thought through set of principles and procedures, and the gradual uptake of responsibility by the community to prevent conflicts”.

For the past years, according to the manager, “benefits have been shared through the provision of new boreholes and repair of old ones, provision of plastic chairs to communities to facilitate meetings and scholarships for students. This mode of benefit distribution varies tremendously (Jaap, Tshepo and Jon, 2007) year in year out with a chunk of the benefits going into the funding of social service and infrastructure, according to Muir (1993)



weakens the link between natural resource cost and benefit.

The distribution of employment opportunities in the CREMA according to Sheppard et al (2010) spans gender and ethnic considerations. For example, boatmen are Hausas or Birifors from Talawona, Kpanfa and Kantu, three fringe communities where tourists access the Black Volta for river safaris, Tour guides are wala from Wechiau and the rangers are a mixture of Wala and Birifor. The organic Shea venture which employs mostly females' benefits families from all 21 communities (Sheppard *et al.*, 2010). Conscious documentation and consistent implementation of such an arrangement entrust satisfaction, peaceful coexistence, and a strong desire towards the success of the CREMA as it greatly ensures the links community cost and benefits to that of individual households.

Interviews conducted with 15 households in fringe communities had 86.7% of the respondents indicating that community members are satisfied with the current benefit-sharing arrangement though not equitable (100%). The leader of the organic shea cooperative of the CREMA believes that the documentation of the benefit-sharing scheme will prevent future conflicts.

The CEC has realised the need for a comprehensive benefit-sharing plan and has engaged the CREMA technical advisor to draft one according to the CEC chairman. This when completed will give the required guidance for the apportioning and distribution of benefits to the satisfaction of all.

4.2.2.2 Conflict and Conflict Management

The Wechiau CREMA is inhabited by different groups of people of different ethnic backgrounds. The major ethnic groups however are the Wechegee and the Brifor. Cohabitation between these groups of people within the CREMA has been very cordial without any incidence of conflicts, be it regarding lands, natural resources use or benefit sharing. Sheppard *et al* (2010) attributed this "conflict-free" state of the CREMA to the



improvement in social capital, enhanced participatory decision-making processes and village representation on the CEC. This has fostered trust networks and provided mechanisms for conflict resolution. During a key informant interview with the CEC chairman, he said “The improvement of relations between communities because of the creation of the CREMA, has resulted in a very peaceful atmosphere, with communities coming together annually to undertake communal projects and activities for the progress of the CREMA”.

There have over the years, been a few skirmishes between CREMA patrol staff and some members of the CREMA communities with regards to access and use of the natural resources according to Mahama, the head ranger.

100% of respondents interviewed from fringe communities indicated having had one or two issues with the CREMA patrol staff regarding access and use of natural resources from the core zone. 8 respondents representing 53.3% admitted infringing upon the CREMA bylaws and indicated apologising before the CEC when they were summoned.

Issues of conflicts within the CREMA are handled by the CEC and the traditional authority as spelt out in the CREMA's policy and procedures manual as well as constitution. 100% of households interviewed strongly endorsed the continuous existence of the CREMA, indicating that it has become the backbone of the community's developmental agenda.

Conflicts between stakeholders in natural resource management have led on most occasions to the failure of conservation efforts, whether by government or community based (Effah, 2015). A clear assertion of the lack of major conflicts in the Wechiau CREMA by the CEC chairman, is an indication of the community's understanding of the CREMA and appreciation of the advantage of peaceful coexistence to natural resources management and development. The future, with all things being equal is promising for the Wechiau CREMA



in its quest towards sustainability.

4.2.3. Governance Structures and Level of Representation

Governance and Management structures of the CREMAs operate at three levels as suggested by the Wildlife division. The first level is the CREMA Executive Committee which is primarily formed out of the Community Resources Management Committees (CRMCs) of constituent CREMA communities. The powers and responsibilities of the CEC vary from CREMA to CREMA depending on the main objective of the creation of the CREMA but common among them is the maintenance of environmental integrity, reduction of deforestation and forest degradation, promotion of peaceful coexistence of constituent communities as well as their members and the development of economic baselines that will provide sustainable livelihoods for the people. These powers and responsibilities are determined in the CREMA constitution. The Community Resources Management Committee (CRMC) is the second level in the CREMA governance and management structures. It is the local unit of the organisation and is formed at the level of each community (Wildlife Division, 2004). Ideally, it should be based on existing community governance structures, with members representing the various groupings in the CREMA community. The composition and function of the Community Resources Management Committee vary with each CREMA and is usually outlined by the CREMA constitution. The third and very important level of the structure is the individual farmers or landholders who are the primary stakeholders of the CREMA and its governance structures. The farmers and landholders through the CRMC determine the policies and activities of the CREMA and hold the executives accountable through their structures at the community level. They are responsible for constructing and amending the constitution to ensure the effective operation of the CREMA (Wildlife Division, 2004).

Information gathered from key informant interviews and household questionnaire responses



as well as from documentary sources, revealed that all three CREMAs in the Black Volta Basin, in fulfilment of the requirements of the CREMA mechanism towards devolution of authority and decision-making powers to the local authority by government, developed three-tier governance and management structures to ensure the realisation of their core mandate and objectives. Each of these CREMAs developed a governance structure that adapted the bottom-top approach with the first level comprising individual farmers and land users; the second level being the CRMC and the third being the CEC. Each of these levels according to the manager of the WCHS plays a unique role in the decision making and management of the CREMA. This was confirmed in during a focus group discussion with staff of the Wechiau and Dorimon CREMAs.

These governance structures have undergone some modifications and operate slightly differently in each of the three CREMA covered by the study.

The individual farmers and land users who form the basic unit of the governance structure in the Wechiau CREMA comprises all inhabitants, natives, and non-natives settlers of all constituent CREMA communities. They are responsible for several things, including but not limited to, electing representatives to form the CRMC which is the next level in the CREMA governance structure. The community members also ensure that representatives at the CRMC are effective in all their dealings.

100% of respondents of interviews conducted at the household level in the CREMA communities indicated that they attend all community meetings regarding the CREMA and that they took part in electing the CRMC reps of the communities. A good number comprising 80 per cent of respondents were able to mention the names and residential addresses of individuals that were selected in the last four to eight years as members of the CRMC of their community.



The WCHS has the CRMC as the second level in its governance and management structure. The CRMCs was rated as very effective in the execution of their responsibilities as a community-based governance unit by 93.3% of respondents. The remaining 6.7% indicated they have not followed the activities of the CRMC in a while.

Members of the CRMC are elected at the community level during a community meeting. They are elected in a manner that provides a level playing field for all sections of the community to be represented according to the manager of WCHS

The CEC chairman for the WCHS indicated that there is a total of 140 CRMC members coming from 20 communities comprising the CREMA. Each community in the CREMA has a total of seven (7) members making up its CRMC. Members of the CRMCs of each community are elected to comprise 1 representative of the royals, 1 representative of the Landlords “Tendaanba”, 2 representatives of Women and Women groups, 2 representatives of the youth and 1 representative for settlers. This arrangement in the composition of the CRMCs, according to the Technical Advisor to the Wechiau CREMA is to ensure effective participation of all sections of the community through representation and also to improve on the dissemination of information on CREMA matters to all sections of the community through their representatives.

A key informant indicated that “the process is very democratic and representative of the norms and existing governance structures of the communities”. Members of the CRMC serve four years terms and can continue to serve for as long as the groups they represent still find them worthy of representing them at that level.

The CRMCs represents their communities’ interest at the CEC level which the highest decision is making body of the WCHS and ensure that.



- Activities and intervention of the CREMA in their community is executed as planned
- All CREMA by-laws are implemented to the letter and enforced.
- Community's share of CREMA benefits is open to the enjoyment of all community members.
- Disciplinary penalties on community members are meted out accordingly.

The WCHS CEC is the highest decision-making body and the last of the governance and management structures of the CREMA. The CEC is constituted by elected representatives from each CRMC of the constituent CREMA communities. Each CRMC is represented of the CEC by 2 individuals (1male and 1female). Such individuals are collectively agreed on by members of the CRMC on the grounds of honesty, transparency, presence in the community and willingness to serve. There is also a representative of the Wa West District Assembly, where the CREMA is located on the CEC as well as a representative of Nature Conservation Research Centre (NCRC), the NGO offering the CREMA with its required technical support. The Ghana Tourism Authority (GTA) is equally represented on the CEC, with a mandate of ensuring further development of the ecotourism sector of the CREMA.

According to the Chairman of the CEC of the Wechiau CREMA, the main responsibilities of the CEC include but are not limited to.

- Ensuring the smooth running of the CREMA to enhance effective natural resources management and poverty alleviation through the provision of sustainable livelihoods.
- Ensure equitable distribution of CREMA benefits through the development and enforcement of an elaborate documented benefit-sharing scheme.
- Represent the CREMA in all its engagements locally, nationally or internationally.
- Uphold the tradition and cultural heritage of the CREMA catchment area and the



paramountcy as a whole.

The Wechiau structure has a fourth level made up of the overlord of the Wechiau Traditional Area and the divisional chiefs of Tokai and Meter. They are the live patrons of the CREMA, to whom the chairperson of the CEC reports. They are bestowed with the responsibility of

- guiding the elected leaders of the CREMA,
- Provide the needed support in issues of land tenure and resource allocation.
- Provide final arbitration on traditional issues, indiscipline and natural resource conflicts that are beyond the capacity of the CEC.

Ideally, this level (patrons) was meant to be an ex-officio group to the CEC, but the WCHS has elevated it's to the status of a standing governance body (verbal information from CREMA manager, 2019) which gives final say to issues that are difficult to build consensus on.

Below in figure12 is an illustration of the WCHS governance and management Structure.

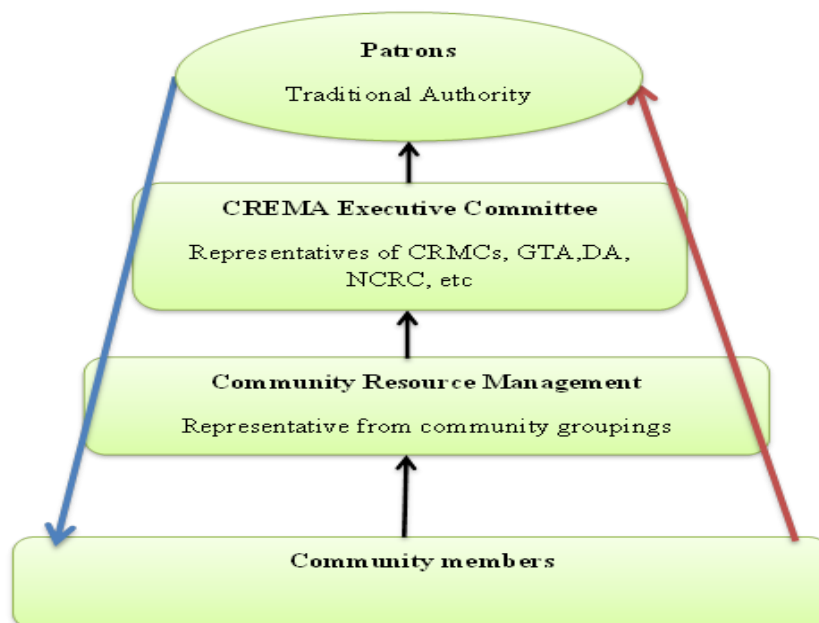




Figure 14: Management and Governance structures of the Wechiau CREMA

Source: Researcher's Fieldwork



The red arrow () represent the bottom-top approach communication linkage between the lower levels of the Governance structure to the apex body of the structure.

Black arrows () represent the bottom top hierarchy of the Governance structures of the CEMA.

Blue arrow () is the representation of the Top-down communication of decisions between the upper levels of the Governance structure to the lower levels

4.2.4. Effectiveness of existing CREMA Management

The effectiveness of existing CREMA management was assessed based on the CREMA's achievement of their environmental, social, and economic objectives, which are detailed in the constitutions and management plans of the CREMAs. The objective of all three CREMAs studied sought to address nine key issues which cut across Environmental, Social and Economics. They include;

1. To bring all communities within the CREMA and other stakeholders under one umbrella to educate, promote and ensure the success of the CREMA.
2. To educate communities on the importance of conservation of the natural and cultural resources of the CREMAs and to stem further habitat degradation.
3. To ensure the survival of the hippo and other ecological fauna and flora in the CREMAs through continuous monitoring.
4. To ensure peace and unity among the CREMA communities to enhance the total development of the CREMA catchment Area.
5. To encourage and facilitate further research efforts in the CREMA areas to expose their potential to attract further investments.
6. To encourage community participation in decision-making on resources management, development of the CREMA communities and other evolving global trends such as



gender and environmental issues.

7. To provide alternative livelihoods to community residents through eco-tourism and other income-generating initiatives.
8. To attract attention to the developmental needs of the human communities of the CREMAs.
9. To ensure equity in the distribution and allocation of CREMA benefits

The CEC and CRMC which are the effector governance structures of the CREMAs are identified as being the institutions responsible for ensuring the achievement of these objectives.

For each of the CREMA, outcomes of the management action towards the achievement of these objectives were examined and evaluated through documentary analysis, questionnaires, key informant interviews and focus group discussions.

Key informant interviews and focus group discussions focused on respondents' awareness of the activities and effectiveness of the governance and management structures, i.e. the CECs and the CRMCs and their allied institutions.

The results on the effectiveness of existing management structures of the Wechiau CREMA as shown in figure 15 are quite high, indicating to a very large extent that those management structures are quite effective in their quest to achieve the outlined objectives of the CREMA. For example, 100% of respondents agree that CREMA management has fulfilled its mandate of providing alternative livelihoods to CREMA members through ecotourism and other income-generating ventures. This response was collaborated by participants of two focus group discussions at the staff and community levels, with several such livelihoods mentioned to include the flagship ecotourism venture of the CREMA which employ over 50 individuals directly and the organic shea harvesting and processing which provides over



2000 direct jobs to CREMA members, especially women.

All (100%) respondents are also in agreement that, a massive effort has been put into encouraging community participation in decision making on issues regarding NRM and CREMA development.

The totality of respondents, representing 100% are strong of the view that the CEC and CRMCs have been able to bring communities and other stakeholders under one umbrella.

93 -94% of respondents agree that the management structures have attracted the needed attention of stakeholder and development-oriented agencies to the developmental needs of the CREMA communities and for the over 20 years of the CREMA's existence ensured the survival of the hippopotami and other fauna and flora.

While 80% are of the view that much has been achieved in educating communities on the Importance of conserving the natural and cultural resources of the CREMA, 73- 74% agree that management has been able to ensure peace and unity among CREMA communities and has effectively presided over the equitable distribution of CREMA benefits.

66-67% Of respondents are agrees to management's enhanced effort at encouraging and facilitating research in the CREMA to expose its potential for further investment.



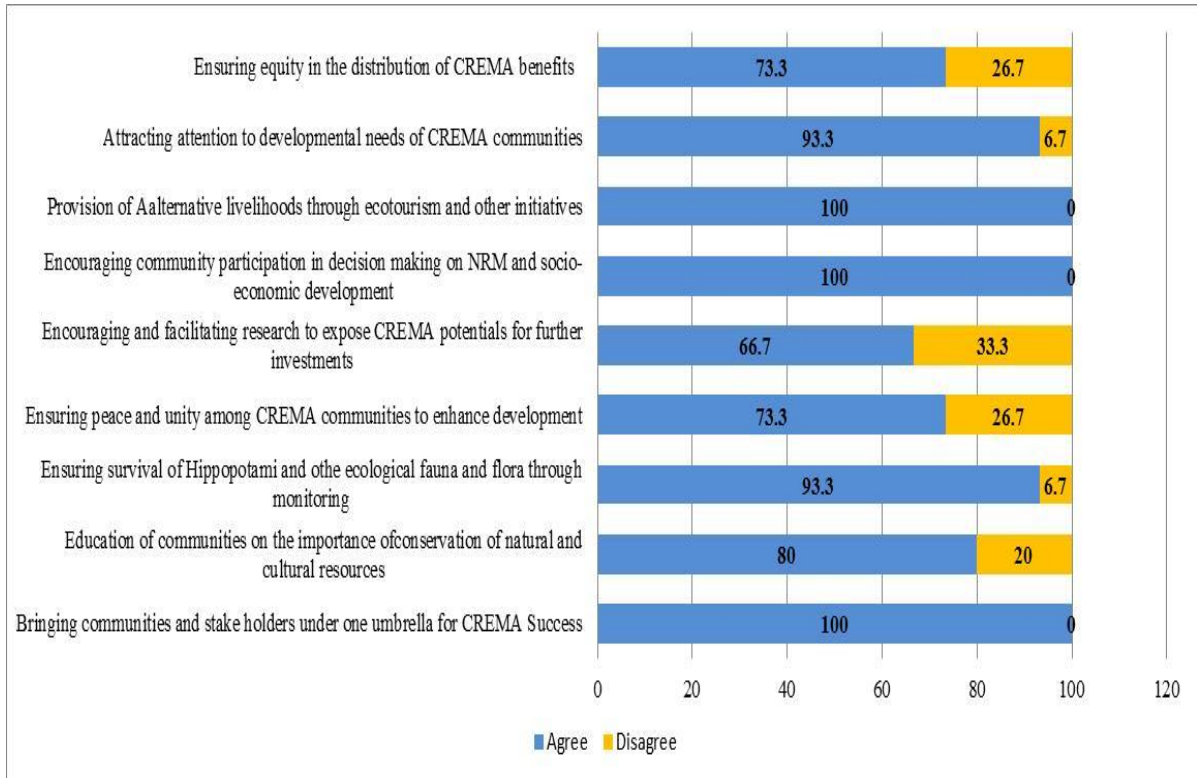


Figure 14: Performance of Management/Governance structures in the achievement of Wechiau CREMA objectives.

Source: Researcher’s Construct

These results presented with regards to the effectiveness of the CEC and CRMCs which are the management structures of the CREMA from questionnaires, focus group discussions and key informant interviews, paints a blissful picture of the CREMAs moving towards sustainability despite the existence of challenges and the need to do even better.

Annual reports spanning the years 2009 to 2015 support most of the claims of respondents on management action towards the achievement of the objectives of the CREMA.

Several livelihood initiatives were found being piloted and a few were in the implementation stage. Among those implemented as of 2010 include the Ecotourism around the hippopotamus (which include river safaris to see hippopotami), Organic shea harvesting and



Honey production. Shea butter processing, organic groundnut production, Moringa processing and organic vegetable production came on stream in 2016. This shows evidence of management's action in meeting the objective of providing alternative livelihood to CREMA members through ecotourism and other income-generating initiatives. This contributes to the attainment of economic sustainability.

The manager of the CREMA in his response as a key informant indicated that some other ventures including organic groundnut production, organic shea honey production and Moringa processing are being piloted and promoted by the CEC. He added that "The sacrifices made by the people in the establishment of the CREMA, demand management (CEC) take serious steps at compensating them with such initiatives, only then can we attain CREMA sustainability"

This stance of the manager is supported by the WD (2004) That communities will see the need of managing their natural resource if they can get tangible benefits from the conservation and management of those resources.

"The implementation of alternative livelihood ventures and other CREMA initiatives are preceded by research and surveys, community education and consultation and approval by the CEC after several deliberations and decision-making sessions with community representatives and relevant stakeholders. This is meant to ensure the achievement of all objectives of the CREMA" according to the CEC chairman.

Management has prioritized ensuring the survival of the hippopotami and other flora and has taken several viable decisions to that effect. The development of CREMA based by-laws is one initiative that has worked very well in the protection and conservation of fauna, especially the hippopotami and flora. Participants of the Focus group discussions explained that, without these by-laws, it will have been disastrous for the CREMA and the Wechiau



paramountcy as a whole. Available documents support the existence of these by-laws and enforce made by management to educate community members on the importance of conservation and the essence and place of the bylaws in ensuring effective conservation and use of natural resources. As indicated by Asare *et al* (2013), effective management of natural and cultural resources requires appropriate local and national laws and their strict enforcement

Participants of Focus group discussions and key informants largely finds the management structure to be as effective as it could be while highlighting several challenges that slow down management's effort at achieving the set objectives in the push for sustainability, said include.

- Inadequate capacity building for CEC and CRMC members in relevant NRM fields
- Inadequate financial resources to hold meetings regularly at CRMC Level.
- Lack of detailed reporting and accounting to community members by CRMC on CREMA issues and decisions.

When the following are present, evaluation has shown the CREMA can be weak and inactive and the chance that CREMA will achieve or maintain its natural resource management and livelihood goals (Murphree, 2008, Agyare, 2012)

4.3. Dorimon CREMA

4.3.1. Contribution of CREMA Mechanism to effective conservation and management of Natural Resources

i. Hippopotami

Hippo monitoring for the Dorimon CREMA was successfully conducted on all five established river transects in 2017, 2018 and 2019. Transect 1 runs from the Northern boundary of the CREMA (Kachuu) to Siira, transect 2 runs from Siira downstream to



Gonjogle, Transect 3 run from Gonjogle down to Jambusi and Jambusi down to Chietanga constitute Transect 4. Chietanga to Mwalayiri forms Transect 5 which is very rocky and shallow resulting in segmentation of the river course in the dry season.

In the 2017 dry season monitoring of hippopotami, a total of 7 individuals were observed and counted, distribution by age and sex is presented in Table 5 below.

Table: 5 Distribution of Dorimon CREMA Hippopotami by age and sex

Year	Adult Male(s)	Adult Female	Juvenile	Unknown	Total
2017	1	4	1	1	7
2018	1	2	1	3	7
2019	4	5	1	2	12

Source: Researcher's Fieldwork

All of these hippopotami were observed on transects 2, 3 and 4 with no hippopotami recorded on transect 1. The transect with the highest hippopotami population of 5 was transect 2 which runs from Siira to Gonjogle.

The total population of hippopotami recorded for the year 2018 stood at a total of 7, similar to that recorded for 2017, with a sex and age distribution of 1 adult male, 2 adult female, 1 juvenile and 3 unknowns as shown in table 2 above. 2019 figures for hippopotami monitored in the Dorimon CREMA stood at 12 with age and sex distributions as presented in table 2. This record is a huge improvement compared to that recorded for 2017 and 2018. Nonetheless, considering the gestation period and vulnerability of the species, with a population as low as 12, a few chances of deaths of mature adults according to Eltringham (1999) could significantly affect the hippopotami population of the area. This, therefore,



calls for serious management action in the protection and conservation of the hippopotami.

Comparatively, the Dorimon CREMA section of the Black Volta River is shallow, with most sections of the river becoming disjointed during the dry season exposing the species to the effects of anthropogenic activities such as farming and settlements, which are very visible on the banks of the river. The spread of farming activities along the riverine belt is much pronounced thereby preventing the creation of exit points and limiting hippopotami grazing areas, a phenomenon that directly affects hippopotami population and density. This is supported by the findings of (Chansah 2016) that the loss of food supplies due to human activities within and around hippopotami habitats is a major factor in the control of hippopotami densities.

Transects 2 and 3 consistently host hippo populations throughout the study, indicative of relatively deeper waters along those stretches of those two transects. It was observed that these transect had the banks intact to a larger extent with the availability of hippopotami grazing areas which greatly contribute to the availability of hippopotami there all year round.

It is quite interesting to note that Dorimon, which is situated between the Wechiau and Zukpiri CREMAs, is the youngest CREMA and has the greatest extent of river-bank farming and other human activities, also has the lowest population of hippos. We would expect that as protection of the Dorimon CREMA core zone (along the river) improves and areas for hippopotami grazing increase, the population of hippopotami is most likely to increase along the stretch.

It is noticeable that the immediate banks of up to 50metres of transect 4 (Jambusi – Chietanga) and transect 5 (Chietanga – Mwalayiri), of the Dorimon CREMA, is used for dry season farming and this has affected the hippopotami population on that stretch. No



wonder these two transects in the three years of the study produced the least record of hippopotami similar to the findings of (Zisadza *et al.*, 2010), when they attributed the overall decline in hippopotami abundance and disappearance in the Mwenezi and Save rivers primarily to drought, siltation and persecution of adjacent communal areas. Anthropogenic activities were commonly observed on both banks of the river. There were fishing nets and camps throughout the river. In addition, tobacco and tomato farms were widely distributed while pits indicative of gold mining or “galamsey” were equally rampant. The booming dry season gardening along sections of the riverbanks is another significant issue of interest that needs urgent attention.

ii. Birds

Avifaunal Surveys were successfully conducted along all five established bird transects in the Dorimon CREMA during the study period. Years covered included 2017, 2018 and 2019.

Monitoring in 2017 lasted a week. Data collected during the surveys of all five permanent transects revealed a total of 86 different species from 611 observations. The number of species recorded was related more or less to the environmental conditions and level of human activities along and around transects. Transect 1 (Chietanga) had the highest number of species of 53 from 99 observations, followed by Transect 4 (Gonjogle) with a record of 49 species from 117 observations. The least performed transect for the 2017 monitoring season was transect 3 (Buka) which had 36 bird species from 85 observations. The average species recorded per transect stood at 45. Bird diversity for the CREMA is strong with a Simpson's Diversity Index of 0.97. The emergence of Transect 1 (Chietanga), as the transect with the highest number of species, could be attributed to its nearness to the Wechiau Community Sanctuary whose conservation actions turn to positively impact resource status on the transect. Transect 4 (Gonjogle) whose vegetation and environment is virtually intact



with the least human activities, had the highest observations but came second with regards to the number of species, contrary to the expectation that transects that record the highest observations eventually recorded the highest species diversity.

Ave-faunal survey conducted for Dorimon in the 2018 season presented a total of 84 species in 517 observations after two visits to each transect. The trend of observations and species distribution wasn't so different from that of the previous year. Transect 1 and 5 recorded the highest number of species of 50 from 101 and 128 observations respectively. Transect 4 which have always been expected to host the highest bird diversity recorded the lowest of 42 species from 103 observations for the year. The average species recorded per transect for 2018 stood at 46, a figure which is slightly above that of the previous of 44. Simpson's Diversity Index calculated Dorimon for 2018 was 0.98.

This year saw the emergence of birth 6 species not previously recorded in the CREMA bringing the total number of birds species known to the CREMA to 92 from its previous record of 86. Species of birds recorded for the first time in the CREMA included the **European turtle dove, grey kestrel, lavender waxbill, short-toed snake eagle and speckle-fronted weaver**, with the **European turtle dove** listed as vulnerable under the IUCN red list criteria.

The emergence of these new species is attributed to initial enforcements of natural resource management rules and improvement in avifaunal monitoring strategies.

2019 monitoring revealed a record of a total of 584 observations for all transect visited. 83 were the total number of species recorded with transects 4 recording the highest number of 52 species with 132 observations. Transect 1 and 5 showed some level of consistency with each recording 49 species from 110 and 143 observations respectively. The least performed transect for 2019 was transect 2 with 44 species from 89 observations.



The average species count stood at 48 with 0.98 being the Simpson's diversity index calculated for 2019. This value which stood at 0.97 in 2017 appreciated to 0.98 in 2018 and was maintained in 2019. This is indicative of a very strong avifaunal diversity status of the CREMA. Further effort at maintaining such a status will entrench the sustainability prospects of the CREMA.

The assemblage of species of birds was similar for all transects for the three years of the study except for transect 2 (Chietanga) and transect 4 (Gonjogle) which were outliers in the years that they emerged as the transects with the highest number of species.

Figures 8 and 9 below, gives a comparison of the number of species and total observation across all the year of the study.

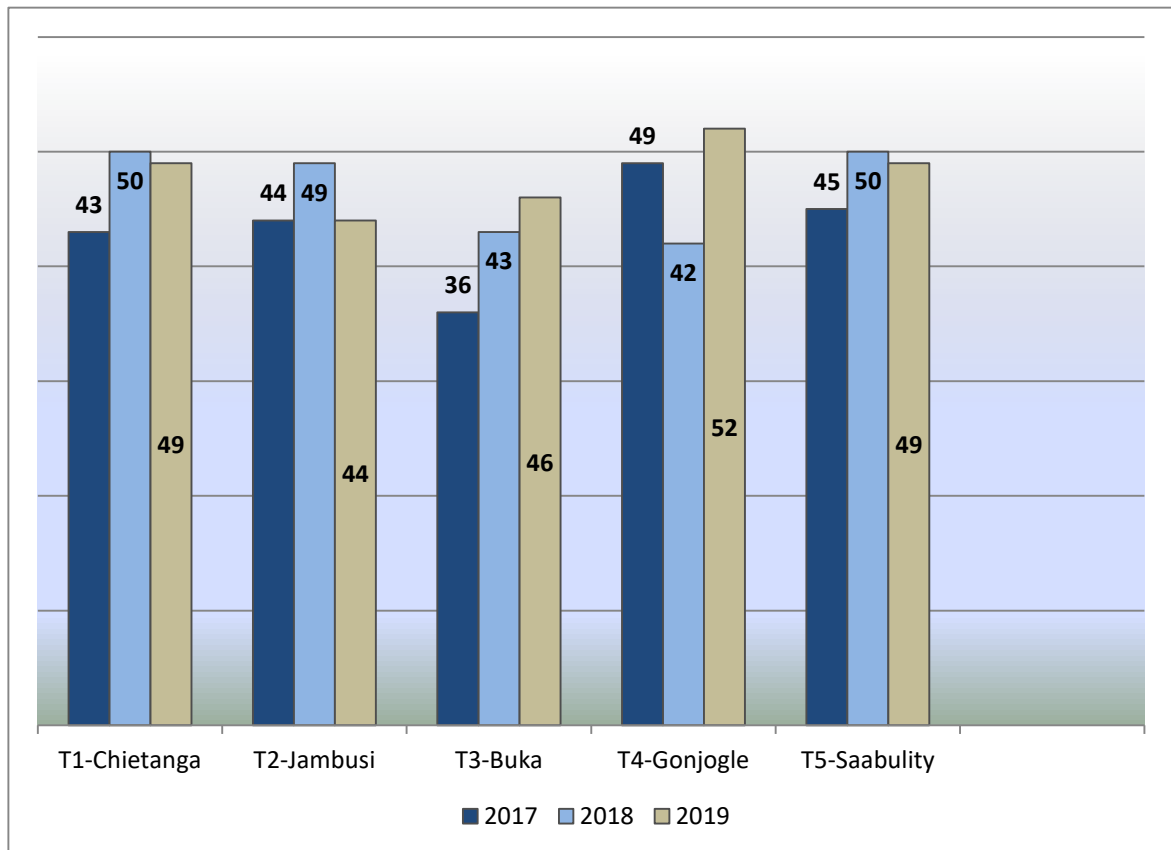


Figure 15: Comparison of species richness across different years for the Dorimon CREMA

Source: Researcher's Fieldwork



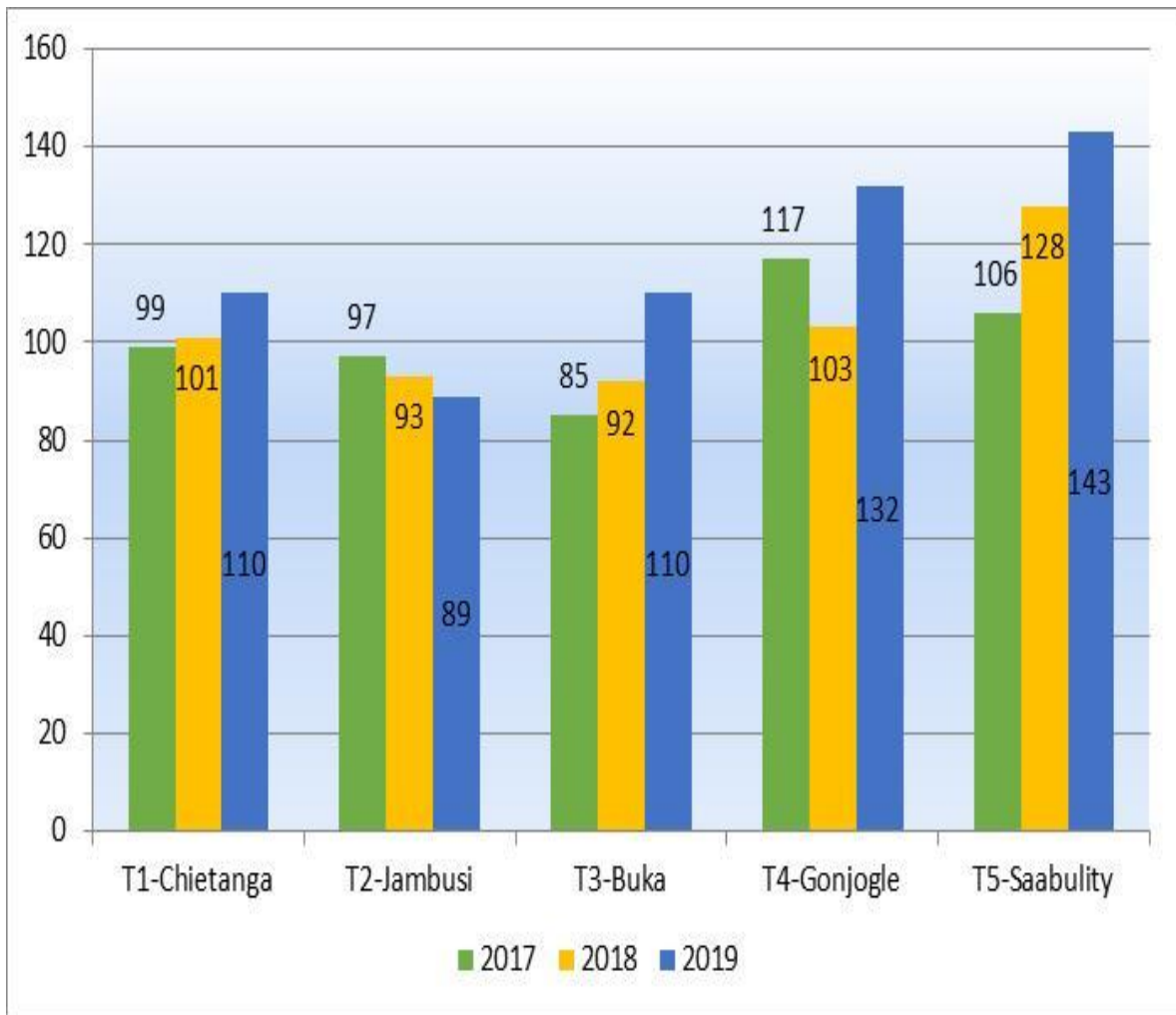


Figure 16: Comparison of total observations across different years for the Dorimon CREMA

Source: Researcher's Fieldwork

iii. Vegetation

A count total of 986 individual plants comprising 29 species were identified in the 9 quadrats laid within the riparian zone of the Dorimon CREMA. This generated a Simpson's diversity index (SDI) of 0.89, though strong, the SDI value is the lowest among that calculated for the three CREMA in the basin.

The total plant count within the three 50m X 50m quadrats laid for trees with dbh ≥ 10 cm was 351, comprising 23 species. *Vitellaria paradoxa*, *Combretum spp* and *Parkia Biglobosa* are the most dominant. Within the 20m X 20m quadrats, a total plant count of 474 was made,



comprising 16 species. The dominant species within this quadrat was not different from that of the 50m X 50m. *Vitellaria paradoxa* has a relative density of 52.3%, followed closely by *Combretum spp* with 39 %. In the 1m X, 1m quadrats which were laid in each 20m X 20m quadrat for assessing ground cover; a total of 7 species was recorded from a count of 161. Ground cover in all the quadrats was good.

Table 6: Summary of the floristic Composition of the Dorimon CREMA

Plot location	Upstream	Midstream	Downstream
Tree layer ≥ 10 cm DBH			
Number of individuals in 50mX50m	139	86	126
Number of species in 50mX50m	20	11	21
Mean DBH [cm]	25.70	27.63	23.44
Shrub layer < 10 cm DBH and ≥ 1.5 m			
Number of individuals in 20mX20m	122	154	198
Number of species in 20mX20m	13	14	9
Herb layer < 1.5 m			
Number of individuals in 1mX1m	86	45	30
Number of species in 1mX1m	5	6	7

Source: Researcher's Fieldwork

It is clear from the tree count that, the tree population of the Dorimon CREMA was comparative low due to excessive felling for fuelwood, charcoal production and construction of houses as indicated by 30% of respondents interviewed. There exist visible



abusive lopping of branches and cutting of trees including fruit trees. The most dominant of the species identified, *Vitellaria paradoxa* stands out also the most sort after the tree for fuelwood and charcoal production, this trend risks its position as the major source of additional income to households and its potential of becoming a platform for financial sustainability of the CREMA.

The appreciably good count of young plants of dbh below 10cm in the 20m X 20m quadrats gives some hope of replenishing the current increasing loss of trees in the CREMA. This is possible with effective conservation efforts through the implementation and enforcement of rules and regulations.

iv. Habitat Condition

The Dorimon CREMA is the most recently established CREMA and before the AgNRM project has not benefitted from conservation efforts. The general habit conditions were studied using established bird transects. From the beginning of the transects to the end, a change from intensive agriculture giving way to shrublands and woodlands interspersed with food crops production is common. There was no significant variation between the different transects in the vegetation or land-use types as vegetation variables did not differ much between transects and/or segments within transects. Critical observations of human activities observed along the transects included human settlements, fuelwood harvesting, extensive farming up to the riverbank, extensive herbicide use, fishing camps along the riverbank, and grazing of domestic animals. Notably, at least 500m radius of all five transects visited were completely burnt with no sign of efforts at controlling wildfires. These result in the reduction of the habitat of various fauna and also the scarcity of grazing areas for hippopotami and other mammals.





Plate 3: Farming on the riverbanks of the Dorimon CREMA

Source: Researcher's Field work

4.3.2. Benefits of the CREMA Mechanism to Communities

Benefits realised by the Dorimon traditional area since its adoption of the CREMA mechanism through countable cut across environmental, socio-cultural, and socio-economic lines.

i. Revenue to CREMA

The CREMA in its two years of establishment has been exposed to three sources of revenue. Two of these revenues are internal to the CREMA and have increased steadily over the past two years. The CREMA in 2017 succeeded in establishing a one-acre vegetable garden for the cultivation and sale of vegetables all year round. According to the CEC chairman of the CREMA, “the venture in the first year of its establishment fetched the CREMA a revenue of GHS 1,120 as a premium from the sale of vegetables from two rounds of cultivation. 2018 saw the premium from the vegetable production venture decrease slightly to an amount of GHS 1,030 at the end of the year”. The initial investments estimated at GHS 30,000



according to the Manager, was borne by the AgNRM project, which continued to bear the cost of production until its abrupt end in 2018. The vegetable production venture was the first and major stream of income to the CREMA. Other livelihood ventures including Shea nut collection, Moringa production and oyster shells collection are being worked on with some in their pilot stages aimed at increasing and sustaining the CREMA's revenue while offering constituents a diversity of income-earning sustainable livelihoods.

Internal transportation service run by the CREMA was cited as the second stream of income by the CEC chairman. With a tricycle, the CREMA offers transport service for constituents at a comparatively low fare between CREMA communities due to the lack of readily available transport. In 2018 when the transport service commences, the CREMA realised revenue of GHS 600 after expenses. This increased to GHS1000 the following year of 2019 and it's expected to increase in the coming years. The CREMA has also continued to receive grants from external donors for CREMA management and biodiversity monitoring. External support for the years 2017 and 2018 is more than USD1, 000.

ii. Employment

The CEC chairman indicated that, the establishment of the CREMA in 2016 to date has employed about 240 individuals in various sectors of CREMA work and the local economy. Approximately, 16 of these individuals are staff of the CREMA who are on commission. 120 are men and women engaged in vegetable production and the remaining are into the production of various Moringa products.

Efforts are currently being put in place according to the manager, is to secure a reliable buyer of Shea nuts and butter from the CREMA. This venture if materialised could lead to the employment of over a thousand Shea pickers who will receive enhance additional incomes for the households



Table 7: Employment Breakdown at the Dorimon CREMA

Position	Nature of employment	Number of people
Manager	Commissioned	1
Biodiversity Monitor/Tour guide	Commissioned	10
Boatman	Commissioned	5
Gardener	Occasional	120
Moringa producers	Occasional	100plus

Source: Dorimon Paramountcy CREMA (2019)

iii. Environmental awareness

The study revealed a strong indication of an increase in the communities' awareness of the importance of conservation and natural resources management. Eleven (11) households heads, representing 73.3% of the total of 15 households interviewed, cited increased environmental/ecological awareness as one of the major benefits of the establishment of the CREMA. This they said resulted in a Tree planting exercise on degraded portions of the core zones of the CREMA in collaboration with the Water Resource Commission in 2017.

According to the CREMA manager, "A total of 2,000 seedlings that were planted in the core zone at about 25m from the bank of the river in 2017 was hugely burnt by uncontrolled fires in the dry season of 2018 leaving less than 100 seedlings which are still struggling to survive"

Though the survival rate of trees is not encouraging because of burning by uncontrolled fires, the Manager said, the communities fringing the core zone has seen and embraced the need to conserve and manage the resource around them, this is evident in that, the remaining



seedlings in the core zone has been fenced and fire belts cleared around them.

A reduction in illegal mining activities (galamsey) was also cited by 46.6% of respondents as a huge benefit that they the fisherfolk living in the community has realised from the creation of the CREMA.

Gradual increment in hippo population and bird species was cited by Fulani CRMC member, as one critical benefit of the establishment of the CREMA that could lead to the realisation of the ecotourism aspirations of the CREMA.

iv. Community Empowerment

The empowerment of the constituents as custodians and decision-makers regarding the management and use of the lands and natural resources has also been enhanced through increased consultation with community members on CREMA and district development interventions. All 15 household heads interviewed affirmed that for the two years that the CREMA has been running, communities have been consulted on one project or another before its execution in the community

4.3.2.1 Benefit Sharing

The study carried out in this CREMA revealed that the sacrifices still being made for the CREMA to be fully established out weights the revenues accrued, as such, the development of a benefit-sharing plan is not of priority to the CREMA and its leadership. The little revenue that is accrued from the CREMAs internal sources is fully used to fund meetings and awareness creation outrages,

Equitability of Benefits however was paramount in the plans of the CEC and that they intend to ensure is guided by a well-documented plan, agreed to and accepted by all constituent crema communities. Current benefit-sharing arrangements in the CREMA is



through the provision of community needs. As and when the need arises, the CEC and its temporal staff carry out a need assessment of the constituent CREMA communities, with priority given to those communities fringing the core zone who are affected more by the creation of the CREMA, for instance, all boatmen and biodiversity monitoring team members come from the fringe communities. The CEC chairman indicated that “This current arrangement will change with time but for now, it is the most equitable decision we can take”

House household interviews conducted revealed 100% of households indicated the absence of a documented benefit-sharing scheme that will ensure equitable distribution of benefits in the future.

4.3.2.2 Conflicts and Conflict Management

Perpetual conflict and lack of trust between park management and local fringe communities regarding ownership and use of natural resources were some of the disadvantages of the fortress system of natural resources management that led to the introduction of the CREMA mechanism in Ghana.

In the Dorimon CREMA, the ethnic relationships that exist do not favour major conflicts. In a focus group discussion with traditional authority and CEC, both bodies indicated there haven't been any major conflicts in the Dorimon traditional area where the CREMA exist in the past thirty years.

This is affirmed by the 100% respondents of household surveys, when they intimated that, there hasn't been any major conflict in the Dorimon traditional areas for a very long time.

In an interview with the paramount chief and paramount queen mother, however bemoaned the fact that there have been a few minor issues related to land use and natural resources.



These minor issues when brought before them are settled amicably traditional arbitration.

Some community members have also, before and after the creation of the CREMA infringed upon some of the laid down rules and regulations of the traditional area. Such individuals when apprehended is subjected to some disciplinary action by the Traditional Authority. These disciplinary actions include fines and, in some situations, banishment from the community.

Conflicts between individuals or communities regarding the use of natural resources are very rare. There is clearly laid down procedures for conflict management in the CREMA set-up. As and when they arise. CREMA related conflicts are handled by the CEC to which the paramount chief is a patron. Conflicts that go beyond the CREMA are referred to the Traditional council for deliberation and settlement. As such The CEC and the traditional council are the bodies responsible for the settlement of conflicts within and without the CREMA. Thus, a collaboration between the CEC and the traditional authority fosters peaceful institutional coexistence and enhance knowledge and skills in conflict resolution of both institutions.

4.3.3. Governance Structures and Level of Representation

The Governance Structure of the Dorimon CREMA is more or less like that of the WCHS.

The first level in the governance and management structure of the Dorimon CREMA is the community members from the 32 constituent communities that make up the CREMA. Membership of these constituent communities has the responsibility of ensuring the effective management of natural resources at the community level. They do this by constituting CRMCs in each community. The process of constituting the CRMC is not by-election as done in the Wechiau CREMA, but it is through nomination and confirmation of members by the various groups or sections to be represented.



The CRMC is the second level of the Dorimon CREMAs governance structure. There is no specific number of representatives to the CRMC. The size of the CRMC depends on the number of groups or sections in the community as such the Dorimon CREMA has a minimum of five (5) members and a maximum of eleven members making up the CRMC. The CRMC of every community is supposed to meet and also meet with the community to harness their view on CREMA related issues ahead of each CEC meeting. The study however revealed that the CRMCs since their formation in 2017 has not met and that member is unable to recognize each other. 53.3% of households interviewed in the Dorimon CREMA had the heads being members of the CRMCs of their communities. These household heads struggled to provide a full list of the members of the CRMCs in their communities. Each CRMC of the Dorimon CREMA is expected to present two representatives (1 male, 1 female) to form the CEC, which is the highest decision-making body of the CREMA. The CEC of the Dorimon CREMA is the largest in the Black Volta Basin with a total membership of 66. It is led by a chairman and vice-chairman, both of whom are traditional authorities, with the paramount chief and paramount queen mother serving as patrons to the CEC.

Patrons under the governance structure of the Dorimon CREMA do not form a level as found in the Wechiau structure but serve as ex-officio members to the CEC. They play the role of advisors, mediate conflict and developmental issues and also provide guidance and other forms of support to the CREMA. Dorimon CREMA is the only CREMA in the Black Volta basin with a queen mother patron (AgNRM, 2018) who has the duty of ensuring the welfare of women in the CREMA. The CEC since its formation has met thrice, contrary to the quarterly meeting spelt out in its constitution. This, the chairman explained is due to financial constraints. This scenario is detrimental to the effectiveness of the CEC and its mandate in leading the conservation drive of the CREMA. The financial sustainability of



CREMAs is very important, and it's the backbone for achieving most objectives of the CREMA. Agyare *et al.* (2015), stressed that lack of operating funds with local-level institutions leave representatives of those institutions unable to enforce regulations and provide the required services needed for communities to adapt to changing social-ecological context.

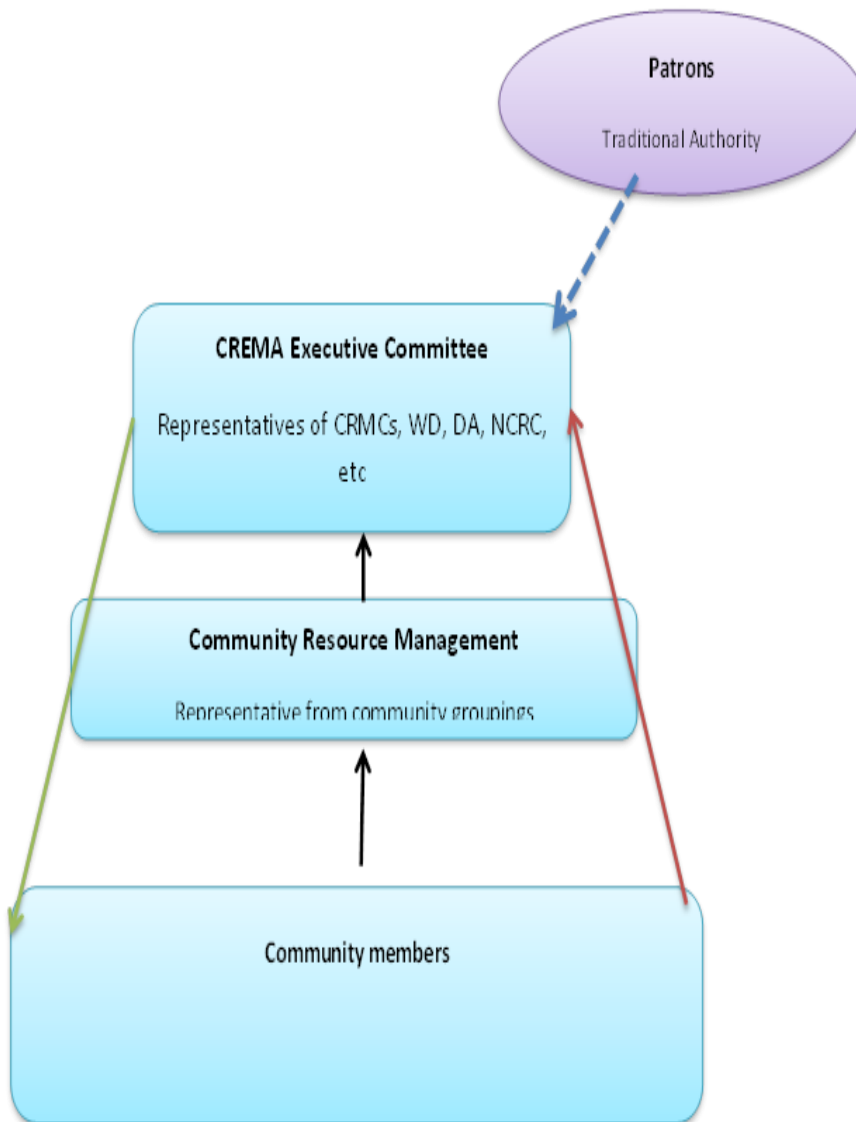






Figure 17: Governance and management structures of the Dorimon CREMA
Source: Researcher's Fieldwork



The red arrow () represent the bottom-top approach communication linkage between the lower levels of the Governance structure to the apex body of the structure.

Black arrows () represent the bottom top hierarchy of the Governance structures of the CEMA.

Blue arrow() is the representation of the Top-down communication of decisions between the upper levels of the Governance structure to the lower levels

Blue broken Arrow () represent patrons' input into CEC decision making.

4.3.4. Effectiveness of existing CREMA Management

Though the youngest of the three CREMAs being studied, the Management of the Dorimon CREMA is on its “wheels” at ensuring the achievement of the set of objectives of the CREMA. This is evident in the response taken for respondents of administered questionnaire during the study. Figure 16 gives a summary of responses.

100 % of respondents agreed that a lot of action has been put in by management at attracting attention to the developmental needs of the CREMA. This was confirmed by a CREMA member in a focus group discussion that “the effort of leadership/management is what leads to the rapid establishment of the CREMA” In a related discussion with a key informant, Naa Bawa stressed that “management is using the CREMA as a tool to attract development to the Dorimon area, and we are seriously at it” This is evident when another key informant indicated that ‘the traditional council has for many years sought to establish this CREMA with the intention of attracting the attention of the international community to the developmental needs of the area”

86-87% of respondents are of the view that management has to a large extent succeeded in bringing CREMA communities other stakeholders under one umbrella to work towards the



success and development of the CREMA. This is per the definition of CREMA and the first criterion in CREMA establishment as captured by WD (2004). The same percentage (86-87%) of respondents, as captured in figure 16, indicated management's action towards encouraging and facilitating research to expose CREMA potentials for further investment as overwhelming. With such a high percentage of approval, it's clear how effective the CEC and CRMCs work at achieving this objective

On ensuring peace and unity among participating communities to enhance development, 60% of respondents agreed that management has been effective in that regard and 53-54% believe management has put in the necessary action such as the enactment of by-laws and pronouncement of the hippopotamus as a taboo; in ensuring the survival of hippopotami and other fauna and flora alongside encouraging community participation in decision making regarding NRM community development issues. A participant of the FGD stated that "when one pinch the hippopotamus, it is as if you have pinched the entirety of the Dorimon paramountcy"

More than 50% of respondents however think that management has not done so well in a few areas including

- Provision of alternative livelihoods through ecotourism and other income generation initiatives (73-74%)
- Ensuring equity, I the distribution and allocation of CREMA benefits (66-67%)
- Educating communities on the importance of conserving the natural and cultural resources of the CREMA (60%)

The abysmal performance of management in these areas according to the manager of the CREMA was because of some challenges which includes.

- i. Inadequate community mobilisation skills and leadership capacity on the part



of CREMA leadership to whip up interests of the local community members in collective decision making

- ii. Inadequate alternative livelihood ventures to cushion the sacrifices of fringe communities
- iii. Very low community sensitization and education on the CREMA mechanism and natural resource management.

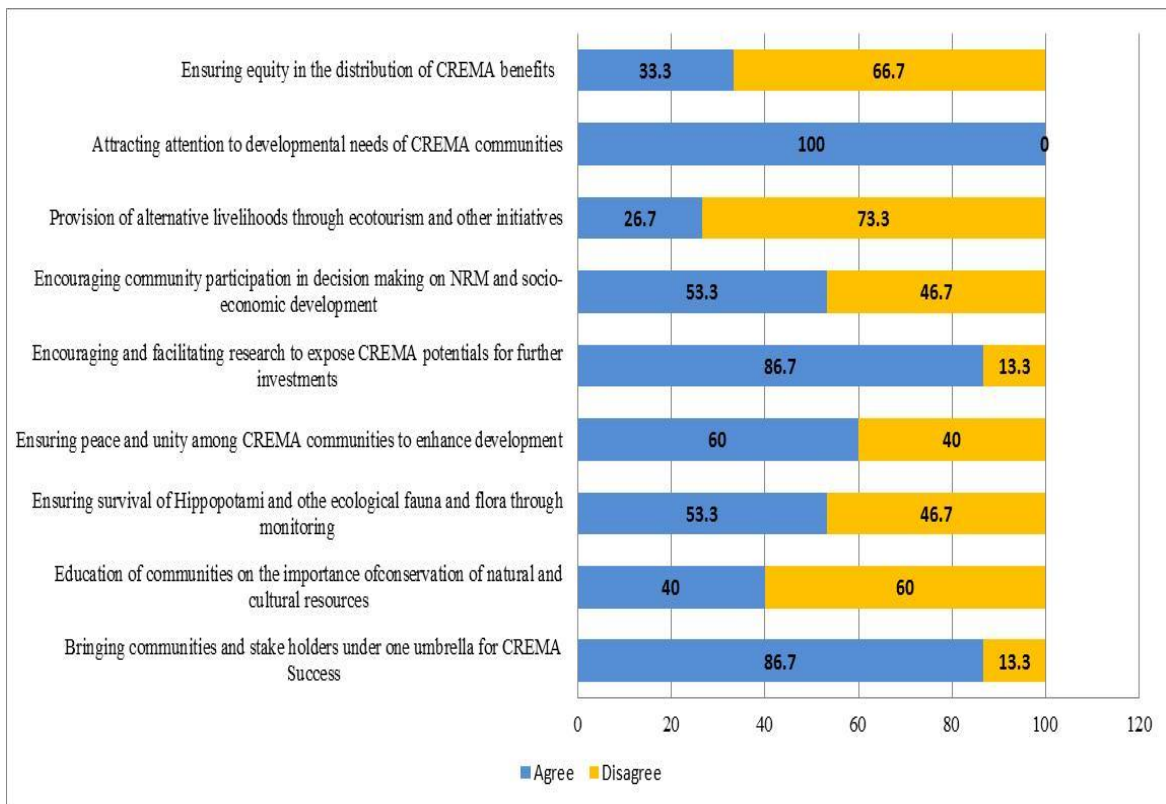


Figure 18: Performance of Management/Governance structures in the achievement of Dorimon CREMA objectives

Source: Researcher’s Fieldwork



4.4. Zukpiri CREMA

4.4.1. Contribution of CREMA mechanism to Conservation and Natural Resources Management

i. Hippopotami

From table 2 which gives a summary of data recorded for three years of hippopotami monitoring, it can be observed that successful hippopotami monitoring activities along all four transects in 2017 produced a total record of two (2) individuals. The wet season which is usually characterised by high water level, increased turbulence of river flow and flooding of riverbanks produced no record of hippopotami nor was an observation made of their presence. The dry season monitoring, however, produced two hippopotami which were the total recorded for the year. Transect three (3) produced all the sightings which comprised 1 adult female and 1 juvenile.

2018 produced the highest record of hippopotami so far in the Zukpiri CREMA with 19 individuals with distribution by age and sex indicated in table 2 below

Table 8: Distribution of Zupkiri CREMA Hippopotami by age and sex

Year	Adult Male(s)	Adult Female	Juvenile	Unknown	Total
2017	0	1	1	0	2
2018	3	5	0	11	19
2019	4	6	2	5	17

Source: Researcher's Fieldwork

The distribution of hippopotami observations also indicated some consistency with previous monitoring activities, in that transect 1 and transect 3 produced a chunk of the hippopotami



observed for the year. These suggest an indication of deeper sections of the river course along the stretches covered by the two transects. Transect 3, which yielded the majority of the hippopotami population of 12 spans the core zone section of the CREMA where conservation activities and patrolling is much more intense compared to other sections of the CREMA.

The total hippopotami population for the Zukpiri CREMA in 2019 stood at 17. Adult males numbered 4, with 6 adult females, 2 juveniles and 5 unknown species. Transect 3 maintained its unique characteristic of accommodating the highest number of hippopotami sighted during the monitoring. This transect by all standards qualifies for the siting of a safari boat station should the Management of the CREMA look in the direction of establishing an ecotourism venture around the hippopotamus.

Environmental conditions around the banks of this transect were observed to have encountered very little human interference hence a good plant cover and available hippopotamus grazing sites. According to Perry, 2015, hippopotami will likely not travel far from their territory once they have sufficient grazing areas close to the river.

The CREMA based team who independently conducted the monitoring has exhibited the potential of continuing so in subsequent monitoring sessions. However, the need for continuous practice to deepen their expertise is obvious, judging from their observations in 2017 and conservative display in categorising all uncertain individuals as unknown sex or age groups.

Observation of anthropogenic activities that could have negative impacts on the hippopotami populations was equally rampant. Common activities included widespread use of fishing nets across the river, fishing camps along the riverbank, and farming of tobacco, though this was mostly on the Burkina Faso side of the river. The most worrying



development remained the seeming expansion of illegal gold mining (galamsey), though this occurred outside the core zone of the CREMA. Local fishermen attributed a bizarre coloration observed downstream of the river to this increasing menace.

ii. Birds

With an overall observation of 611, the Species richness of the Zukpiri CREMA stood at 90 birds at the end of an avifaunal survey conducted in the 2017 monitoring period. Transect 3(Meguro) recorded the highest number of bird species with 56 species from 124 observations while Transect 5(Kachuu) recorded the least with species richness of 41 from total observations of 96 for that transect. The average species richness for 2017 was 58 species per transect. Avifaunal diversity calculated for this period was 0.98, a figure that indicates strong diversity based on counts/observations and a corresponding number of species. There were not many differences in species assemblages among transects during the entire monitoring period.

Contrary to observations from the other two CREMAs along the Black Volta basin, in the Zukpiri CREMA, dry season surveys which usually yielded lower species this time round recorded higher species richness than the wet season survey. Against 87 species recorded during the wet season, the dry season surveys yielded 90 different species. However, individual transect performance and the average number of species was better from the wet season While an average of 58 species per transect was recorded from the wet season, there was an average of 50 species per transect during the dry season. The relative performance of individual transects was however inconsistent precluding the establishment of any pattern except that the best-performed transect from the dry season was realised from the closest transect to the forest, Transect 3(Meguro).

A visit to the bird transects of the Zukpiri CREMA produced a species richness of 74 from



584 observations during the 2018 monitoring session. There was a maximum of 57 species on transecting 1 in 136 observations and a minimum of 38 species on transect 5 in 93 observations. An average of 46 species per transect was recorded, With a Simpson's Diversity index of 0.97. Though the lowest diversity index recorded by the Zukpiri CREMA for the three years of study, still stands as an indication of a strong avifaunal diversity for the CREMA.

2019 survey presented data that reflect an appreciation in both numbers of observations and species. With a total of 616 observations made from all five transects, the total species count stood at 79. This number of species is slightly higher than than of the previous year which 74 was. The best performing transect was transect 4(Zukpiri) with total observations of 133 while the least performing transect, transect 2(Kpaala) recorded 41 species from 105 observations.

An average number of species per transect was 45 with the Simpson's Diversity index of 0.98.

Commutatively across all transects in the three years of study, 18 new species of birds were recorded, increasing the overall number of birds known to the CREMA from 115 to 133. While species including woolly-necked stork, squacco heron, hooded culture, black-bellied bustard, common quail, wood sandpiper are first time recorded to the CREMA, Verreaux's eagle owl and African mourning dove are entirely new records along the whole of the Black Volta basin.

Comparing species richness observed across the years of study, 2017 produced the highest with 90 different species and an average of 58 Species per transect observed as against 74 species with an average of 46 species per transect for 2018 and 79 species with an average of 45 species per transect for the 2019 monitoring period. The avifaunal diversity data for



Zukpiri presents a complex matrix that makes it difficult to deduce a trend for the CREMA. For instance, transect 1(Baase)which recorded the least number of species for 2017 was the best-performed transect in species richness in 2018 before becoming the second-to-last in species performance for 2019. Similarly, transect 4(Zukpiri) which has a high degree of human interference, recorded the least species richness in 2018 but emerged with the highest species diversity in 2019. Subsequent monitoring results will be significant in determining the trend and species richness relationship for the Zukpiri CREMA. Nevertheless, Zukpiri has shown positive progress to environmental/biodiversity sustainability with such strong diversity indices

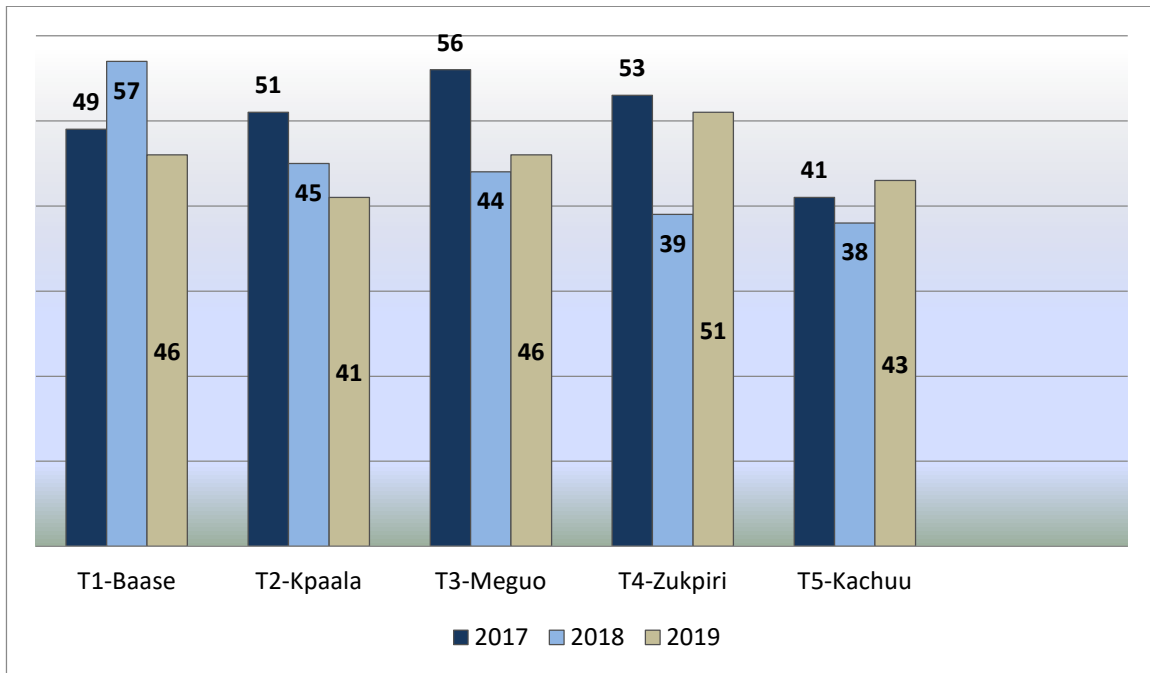


Figure 19: Comparison of species richness across different years for the Zukpiri CREMA

Source: Researcher’s Fieldwork



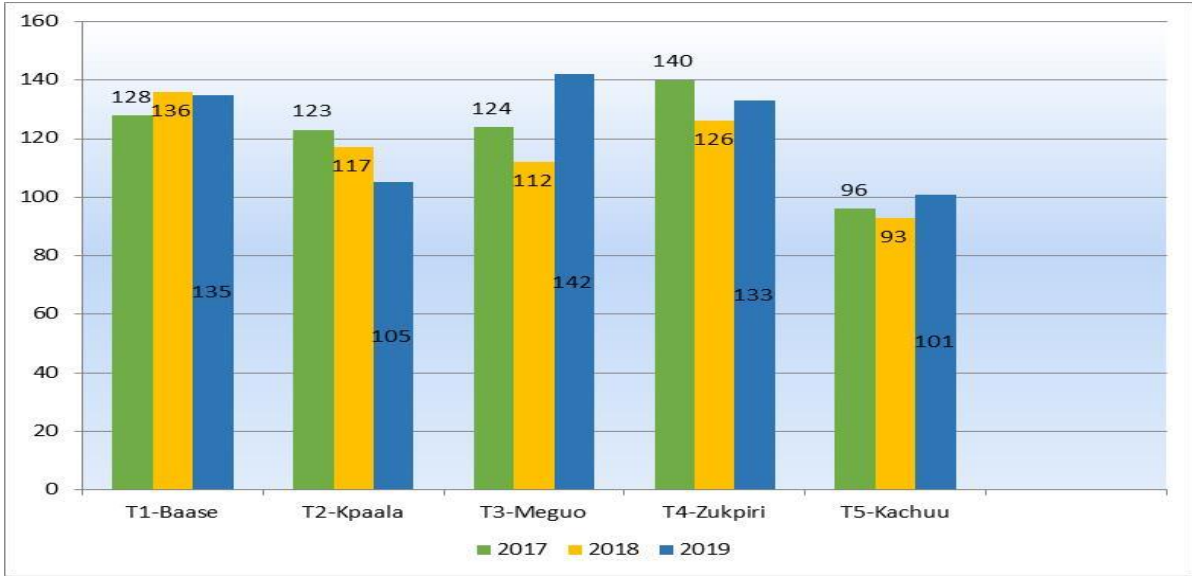


Figure 4: Comparison of the number of observations across different years for the Zukpiri CREMA

Source: Researcher’s Fieldwork

iii. Vegetation

With a Simpson’s diversity index (SDI) of 0.94 calculated, Zukpiri stood out quite clearly as the CREMA with the highest plant diversity and abundance as shown in table 3 below. From the 9 quadrats of different sizes laid at different points in the core zone, a total plant population of 1281 was identified and counted. The total species encountered stood at 37. The mean number of individual plant species recorded from the quadrats is 22.3 for the 50mX50m quadrats, 15.34 for the 20mX20m and 8.67 for the 1mX1m quadrat.

Relative density of plants which comprise trees with dbh ≥ 10 cm in the 50mX50m quadrat stood at 36.77% shrubs and young trees within the 20mX20m quadrats with dbh < 10 was found to have a relative density of 46.45% while the herbs within the 1mX1m quadrats had a relative density of 16.78%

The most dominant plant species within the 50mX50m and 20mX20m quadrats were *Vitellaria paradox* followed by *Combretum spp.* A good population of Baobab (*Adansonia*



digitata) and Locust beans (*Parkia biglobosa*) was recorded in the Zukpiri CREMA during the study. These two plant species are of high economic and medicinal value in Ghana and internationally.

The diversity of plant species recorded in the Zukpiri CREMA has shown more uniqueness compared to that of the Wechiau and Dorimon. This affirms the CREMA's main objective of ensuring the sustainable management of the floral composition to provide raw materials for the local herbal industry (Zukpiri CREMA Constitution, 2010). With a core zone that has not experienced burning for over ten years, the density and diversity of the herbaceous ground cover are as expected. Much however must be done in tapping into the economic aspects of the non-timber forest products through sustainable harvesting and value addition to build an economic baseline that will offer employment and rake in additional sustainable revenues for the CREMA.

Table 9: Summary of the floristic Composition of the Zukpiri CREMA

Plot location	Upstream	Midstream	Downstream
Tree layer ≥ 10 cm DBH			
Number of individuals in 50mX50m	159	186	126
Number of species in 50mX50m	23	20	24
Mean DBH [cm]	24.90	25.65	26.29
Shrub layer <10 cm DBH and ≥ 1.5 m			
Number of individuals in 20mX20m	216	188	191
Number of species in 20mX20m	15	18	13
Herb layer <1.5 m			
Number of individuals in 1mX1m	73	72	70
Number of species in 1mX1m	11	7	8

Source: Researcher's Fieldwork



iv. Habitat Condition

Along the five permanent bird transects of the Zukpiri CREMA, the vegetation varied from one transect to another and from the start to the end of each transect. Early segments tended to include settlements (though not in all cases) and farming activities, followed by a variation of Shea and Dawadawa savannas, woodland savanna, hilly and rocky terrain, shrub thickets, a cleared fire belt, marshy areas, and a riverine zone with large trees and forest cover. On one transect, an observation was made of duiker footprints, a hare, a snake, feline footprints and scat, and hippos in the river. Observation of anthropogenic activities included intensive food crop farming, fishing camps, cattle grazing, and a charcoal pit. Across the river, in Burkina Faso, there were multiple observations of tobacco farms and “galamsey” mining pits.



Plate 4: Fire belt surrounding the riparian zone of the Zukpiri CREMA

Source: Researcher’s Fieldwork

There is a clear fire belt surrounding the entire core zone, this fire belt is cleared annually by CREMA members. The entire core zone is protected from fires, the reason for the zones unburnt state for the past 10 years.



4.4.2. Benefits of CREMA Mechanism to Communities

i. Revenue

The Zukpiri CREMA for its ten years plus of existence has not been able to develop an income-generating activity or venture around its natural resource. There is therefore no major source of revenue generated by the CREMA on its own. A key informant indicated that “an organic shea trade venture was initiated with Wilmar group of companies, but it never worked out as expected. We are looking to explore other opportunities as and when they avail themselves”

There has however been an encouraging support base, logistically, technically, and financially from development partners in various areas of CREMA development and management.

From key informant interviews and focus group discussion held within the CREMA, it turned out that, the CREMA for the past 10 years has received support from, UNDP/GEF/SGP, USAID-AgNRM, WD, EPA, Volta Basin Authority, the Regional Coordinating Council and other donors over GHS 2,200,000 (USD 400,000). These supports are seen as benefits to the CREMA for the sacrifices made and for their conservation efforts. There are however no guarantees for continued funds from donor agencies, which put Zukpiri’s financial situation in limbo, not showing positive signs of sustainability.

ii. Employment

Employment was the most cited benefit by 100% of respondents of household interviews; the CREMA coordinator mentioned during a key informant interview that “Employment in the CREMA is currently on commission base. The CREMA has a staff strength of 25. Five (5) of the staff are stipend receiving executives of the CREMA. The others comprise ten (10) fire volunteer/rangers and ten (10) Biodiversity monitoring team members. None of



these staff receives a salary but is given stipends as and when funds are available”.

The establishment of a dry-season vegetable garden by the CREMA has seen the employment of 200 women, who gain additional incomes from the sales of a variety of vegetables according to the CREMA coordinator.

The certification of some communities in the CREMA as organic also saw the registration of 700 women into the CREMA's organic shea venture. This venture is still however struggling to grow as the initial concessionaire is negotiating the terms of the engagement according to the CEC chairman. The manager also iterated that “Another 150 women have been provided with employable skills through training in the manufacture of various Moringa products, such as soaps, detergents, tea and repair and installation of solar gadgets.

Table 10: Employment breakdown at the Zukpiri CREMA

Position	Nature of employment	Number of people
CEC Executive	Commissioned	5
Fire Volunteer	Commissioned	10
Biodiversity Monitor	Commissioned	10
Vegetable Producer	Commissioned	200
Shea collectors	Temporal	700
Moringa processor and trader	Self	150

Source: Researcher's Fieldwork

v. Other Benefits

Other benefits mentioned included the ease in accessing medicinal plants (73.4%), recognition of the Zukpiri as a CREMA nationwide (60.0%), increase Hippopotami population (46.7%), increasing numbers of visitors to the CREMA (33.4%) and a healthy



environment (33.4%).

Through these benefits, the CREMAs have to a very large extent, reduced poverty by increasing incomes through the employment of constituents in ecotourism, organic shea ventures and other livelihood activities, by improving access to potable water, schools, and lighting and by developing the social capacity to create self-sustaining revenue streams. This is in line with the expectations of a sustainable CBNRM as put forward by Kgathi and Ngwenya (2005) that sustainable CBNRM is supposed to promote the economic growth of rural areas, alleviate poverty, and conserve the environment. The results of the study also suggest that, as community members attain better standards of living through increased income and easy access to basic social needs, they get increasingly empowered to contribute to sustainable developmental activities and decisions on natural resources management and use in the CREMAs.

4.4.2.1 Benefit Sharing

In a focus group discussion, the study established that benefit-sharing in the Zukpiri CREMA is decided upon by the CEC and CRMCs in a manner spelt out in the CREMA Constitution. According to the CREMA coordinator, The CREMA's constitution indicates that benefits that accrue to the CREMA shall be shared equitably among constituent CREMA communities. "In practice, this will require the development of a comprehensive benefit-sharing scheme that even indicates the community's eligibility to a share of the benefits" he added.

At the time of the study, there was no separate document detailing the constitutional provision on benefit-sharing to ensure equity and the satisfaction of inconvenient community communities and members. As such the CEC and CRMCs will usually meet to discuss and assign quotas to constituent communities. The CEC chairman recognised that, the arrangement of the CEC and CRMCs deciding the mode of benefit distribution is



problematic, as beneficiaries are continuously suspicious of the different modalities employed annually.

The CREMA coordinator stated that, benefits shared so far in the CREMA have been in areas of training and capacity building for community members, CRMCs and CEC members. For training that have to do with community members, each constituent community is asked to present individuals for such training based on the size and population of the community.

Benefits that came to the CREMA as grant support from the AgNRM project was in the form of equipment and tools. These were shared with the communities fringing the core zone and to staff who patrol the zone as well as some members of the CEC.

At a focus group discussion involving women, there was a unanimous indication that the benefit-sharing scheme was inequitable and dependent on the discretion of a few. They indicated however that they had no alternatives to the current scheme at the time of the study.

The “Makazie” bemoaned the fact that there was a need to document the scheme and make it as equitable as possible.

4.4.2.2 Conflicts and Conflict Management

Issues of conflict have always accompanied natural resources management, be it at the community level or the national level. In the Zukpiri CREMA, the study revealed that there are no known conflicts between communities, individuals or groups. There are however some conflict issues between staff of the CREMA and individuals occupying prohibited zones and or undertaking activities that infringe upon CREMA bylaws.

Settlement of fisherfolk on the bank of the Black Volta River is an infringement on the CREMA by law on the occupation of protected areas. According to the Secretary of the CREMA CEC, Staff and management over the years have tried the various methods of



relocating these individuals without Success. There are currently talks with these fisherfolks on the effects of the settlement on the riverbank on natural resources management.

Another issue of conflict has to do with the grazing of animals in the core zone of the CREMA. The CEC has had to intervene in conflicts related to the grazing of animals in the CREMA's core zone. These conflicts when they arise are resolved using Alternative Dispute Resolution methods. Among the 15 questionnaires administered to households, 7(46.7%) household representatives indicated having been involved in one conflict or another with the patrol staff. The CEC and Traditional Authority, who handled conflict issues, resolved them to their satisfaction.

4.4.3. Governance Structures and Level of Representation

The Governance and management structure of the Zukpiri CREMA comprises three levels, the community members, the CRMC and the CEC. The first two levels comprise entirely of local representatives. The CEC which is the third level and highest decision-making body are dominated by representatives from the constituent communities but also by other representatives who are not necessarily from any of the CREMA communities according to the CREMA coordinator.

The CRMC, like in other CREMAs is a group selected of individuals from each CREMA community with a primary responsibility of ensuring the adherence to CREMA bylaws, representing communities' interest at the CEC level, and also engaging in public education, dissemination of information and managing conflicts related to access and use of the natural resource. There is no specific number of individuals per CRMC; the number of individuals in a CRMC is dependent on the population and composition of the community. On average, however, six individuals are making up the CRMC of each CREMA community. The CREMA coordinator stated that "The CRMCs on yearly basis take responsibility for ensuring the creation of a fire belt around the core zone as a fire preventive measure. This



activity has kept the core zone and the resources within from experiencing fire for the past 10years”.

The CREMA coordinator in an interview stated that “the CEC in the Zukpiri CREMA is comprised of membership from the CRMCs of the CREMA communities. There are 32 members of the CEC with an executive board of 5 members. The CEC is responsible for fashioning out the effective running of the CREMA as the highest decision-making body. It is also tasked with lobbying for external support to carry out CREMA activities.” There is a single patron to the CREMA with other technical partners including WD, DA, GTA, AROCHA, EPA etc., These partners according to the CREMA coordinator support the CREMA with its logistical, technical, and financial needs.

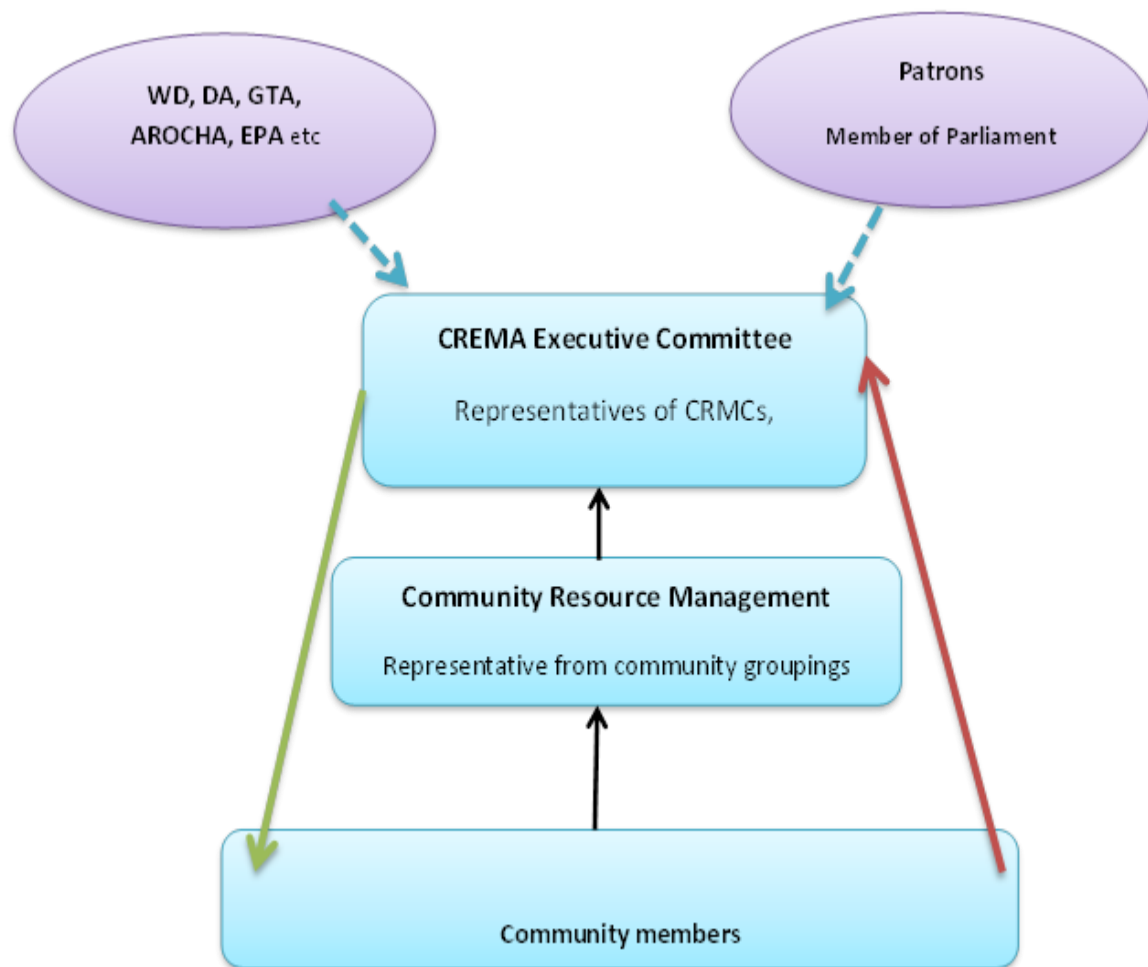






Figure 5: Governance and management structures of the Zukpiri CREMA
Source: Researcher’s Fieldwork



The red arrow () represent the bottom-top approach communication linkage between the lower levels of the Governance structure to the apex body of the structure.

Black arrows () represent the bottom top hierarchy of the Governance structures of the CEMA.

Blue arrow () is the representation of the Top-down communication of decisions between the upper levels of the Governance structure to the lower levels

Blue broken Arrow () represent patrons' and partners' input into CEC decision making.

4.5 Effectiveness of existing CREMA management

The favourable outcomes of management actions in the Zukpiri CREMA like in the Wechiau CREMA are encouraging for the attainment of sustainable CREMAs, should management continue to work and act in a current manner, as portrayed by figure 17 below,

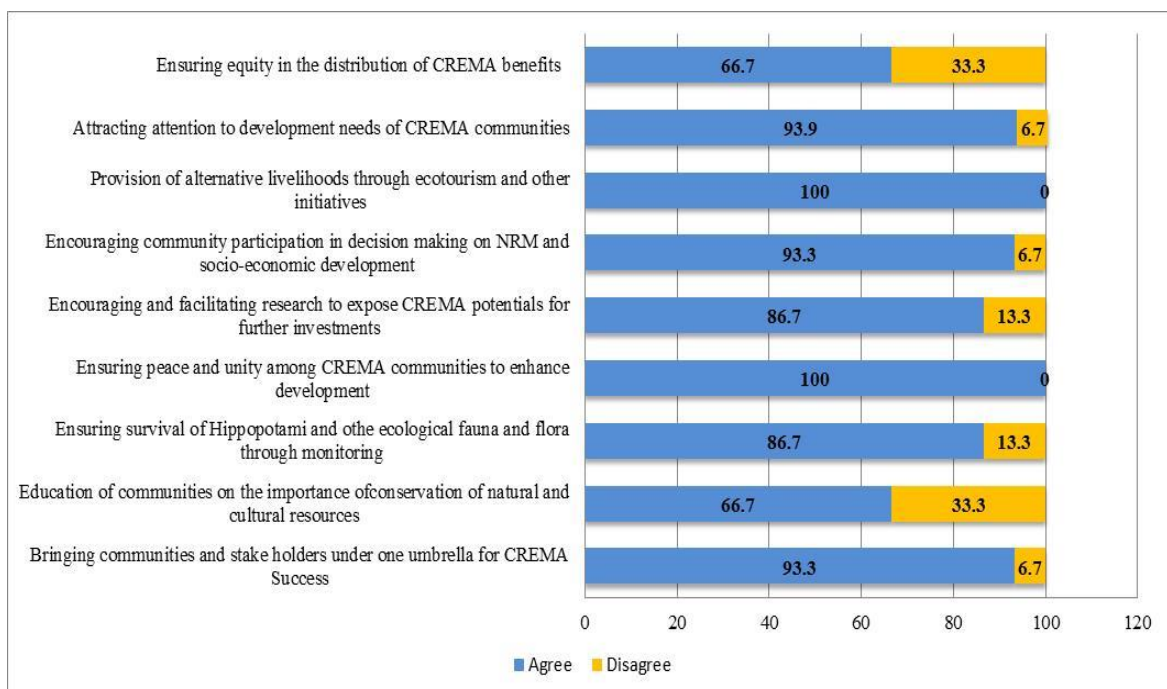


Figure 6: Performance of management/Governance structures in the achievement of Zukpiri CREMA objectives

Source: Researcher's Fieldwork



100% of respondents agreed that management has achieved the objectives of ensuring peace and unity among CREMA communities to enhance development and the provision of alternative livelihoods through ecotourism and other income-generating initiatives.

On attracting attention to the development needs of the CREMA, bringing communities and stakeholders less than one umbrella for CREMA success, and encouraging community participation in decision making, 93-94% of respondents agree that management has tremendously achieved those objectives and should work at sustaining the effort.

86-87% of respondents show the strong agreement of the fact that management action on ensuring the survival of Hippopotami and other ecological fauna and flora as well as encouraging and facilitating research to expose CREMA potentials for further investment has been quite effective over the years. The CEC chairman's response to this issue was emphatic when he said that "there is no such site in the whole of the upper west region where research into medicinal plants among others has been so prioritized". A participant in a focus group discussions alluded to the fact that the facilitation of research into fauna and flora and their potential medicinal value the main priority of the CREMA and its management.

Regarding the education of communities on the importance of conserving the CREMA's natural and cultural resources, 66-67% of respondents agree that management has been active on that and effectively executes it as and when there fills the need.

A similar percentage of respondents (66-67%) finds management to have over the years, done their best to ensure equity in the distribution of benefits to and among CREMA communities.

A similar trend was recorded by Baker *et al.* (2018) that led him to conclude that with increased knowledge and enhanced capabilities of the leadership of CBNRM units,



achievement of the linked conservation and development objectives and the overall goal of such units will be much easier. Mellahi and Wilkinson (2010), stated to the contrary that, where management fails to achieve the objectives of the organization to which they are responsible, success and sustainability become farfetched. These action by management clear show their effort at creating a balance between environmental, social, and economic sectors of the CREMA, a trend that will contribute to the widening of the interface within which the three interact. (See fig. 1)

Real sustainability according to Mensah (2019) is attained when a good balance is struck between the three pillars of sustainability.

The CEC chairman stressed that the activities of the CEC and CRMCs of the Zukpiri CREMA are not without challenges. “These if tackled will put us in the best position of being among the best CREMAs in Ghana,” said a participant at a focus group discussion. According to a CREMA coordinator, these challenges include.

- Increased tensions and heightened mistrust between executives, displaced farmers, and community groups
- Disregard for CREMA regulations by aggrieved individuals who continue to farm and hunt within the core zone.
- Reluctance on the part of some communities to honour their communal duty to the CREMA with regards to its upkeep.
- Inadequate finances to promote conservation and sustainable livelihood activities.

These challenges in related findings by Sheppard *et al.* (2010) have a strong potential of hindering the achievement of a majority of the CREMAs objectives.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

The study examined the sustainability of the Community Resource Management mechanism in the Black Volta basin of the upper west region with particular reference to the three CREMAs in the Basin this; The Wechiau CREMA, The Dorimon Paramountcy CREMA and the Zukpiri CREMA. Biological and Sociological data collected and analysed established the contribution to the CREMA Mechanism to effective conservation and Natural Resource management. The study revealed that CREMA mechanisms has contributed positively and immensely to effective conservation and natural resource management.

The hippopotami population for all three CREMAs studied was found to have consistently recorded increases for the three years of monitoring. Increasing for a total of 36 for all three CREMA in 2017 to 56 in 2019. The number of juveniles as revealed by the study was high compared to that of the adult males and females, indicating the presence of a breeding population. **The study also revealed** steady increments in bird population for all three CREMAs. A good relative diversity index was calculated of the avian community with the discovery of new bird species in some CREMAs and the basin as a whole

The study established that the Vegetation diversity and abundance of the three CREMAs was in a good state and possibly the reason for the good bird population and diversity.

The three CREMA harbour over 50 different plant species with most of them being of commercial and medicinal importance. The average diversity index calculated for the plant community was 0.975. Economic species recorded included Shea tree (*Vitellaria paradoxa*), Locust bean tree (*Parkia biglobosa*) and Baobab (*Adansonia digitata*)



The study revealed that the Habitat conditions of the three CREMA studied was not encouraging. There were unmanaged fire and other anthropogenic activities along all transects walked. Common anthropogenic activities encountered included human settlements, food crop production, irrigation agriculture on the riverbank, plantations of cashew and teak and fuelwood harvesting and charcoal production and grazing of livestock in core zones.

The study established that the CREMAs in the Basin have benefited in various ways from the implementation of the CREMA mechanism. These benefits include Revenue to the CREMAs, employment, infrastructural development, educational opportunities, capacity building, improved conservation and environmental awareness, increased donor support and cultural pride among others

The study revealed that Benefit Sharing in the CREMA is not documented but based on prioritization of community needs.; This makes it is difficult for management to ensure equity in the distribution of bthe enefits.

The study established that there were and has never been any major conflict in the CREMAs regarding land, resource use or benefit sharing. There have however been a few skirmishes between CREMA patrol staff and breakers of CREMA rules and regulations. Such skirmishes are usually handled and resolved by the CEC the traditional authorities.

The study also revealed that the governance and management structures of all the three CREMAs operate at three levels: CREMA Executive Committee, Community Resources Management Committees (CRMCs) and the Community. There are also advisory bodies to these management and governance units, including but not limited to traditional authorities, government agencies and. non-governmental organizations.

The study established that the existing CREMA management and governance structures were quite effective in their mandate, overseeing and taking pragmatic decisions for the



effective management of the resource of the basin .as well as in the provision of employment and alternative livelihoods to CREMA members.

5.2 Conclusion

This study has established that the Black Volta Basin is a unique biodiversity hot spot and the three CREMAs in the basin have shown an indication of a good level of success and progress in the different aspects that the study covered.

The hippopotami population in the CREMAs increased from 36 in 2017 to 58 in 2019. Juveniles and unknown individuals were recorded among the hippopotami population. This is an indication of breeding among the hippopotami population in the three CREMAs. It is also a strong indication that the three CREMAs of the Black Volta Basin are becoming hot spots for hippopotami habitation, which is good for the already fledgling ecotourism activities ongoing in the Wechiau CREMA and an opportunity to develop similar ecotourism activities around the hippopotami in the other two CREMAs.

It was also discovered from the study that the three CREMAs combined, harbour over 200 bird species, making the basin an area of high avian species richness. This is because, the basin and more specifically the three CREMAs, avails to the avian community a range of important habitat types critical to a broad variety of bird species. With close to 89% of the species appearing to be all-year-round residents, provides yet another ecotourism opportunity in bird watching. Several migratory species was sighted in some CREMAs and the basin for the first time; this is a manifestation of the growing integrity of the basin's environment and its conduciveness for habitation.

Vegetation in the three CREMAs presents unique richness and diversity. Such unique richness and diversity in species of vegetation discovered during the study, calls for serious conservation efforts. Some plant species perceived to be rare in other areas in Ghana are



common in the basin, especially in the Wechiau CREMA and the Zukpiri CREMA.

The basin is an important source of non-timber forest products such as Shea nut (*Vitellaria Paradoxa*), locust beans (*Parkia biglobosa*) and medicinal plants. Value chain developed around the sound of the support the livelihoods of constituents while contributing to financing conservation activities. The observance of a good density and rich diversity of shrubs, saplings and herbs is an indication of the effectiveness of the conservation efforts of the CREMAS and a sign of a sustained environment capable of continuously providing the ecological and socio-economic needs of the communities. It is directly responsible for the hippopotami population trends and the rich avifaunal diversity of both resident and migratory birds.

The study revealed that there are several benefits that CREMAS, their constituent communities and members accrue from the adoption of the Mechanism. These benefits are both direct and indirect. The direct benefits come in the form of revenues to the CREMAS, employment of constituents. Women involved in organic shea nut picking get additional income from the sale and processing of nuts. Graduates of Junior high schools from the Wechiau CREMA have the opportunity of gaining scholarships from the CREMA to pursue high education in any field of interest should they pass. Other direct benefit includes infrastructural development for CREMA communities such as the provision of boreholes to provide portable water, livelihood enhancement activities such as training on soap making, receiving payment and stipends from attending meetings or engaging in some onetime CREMA activity, getting a free ride in the CREMA tricycle among others.

The elaborate governance and management structures of the CREMAS has provided for strong and well-represented management bodies. These governance and management bodies of the CREMAS have proved very effective, ensuring equitable representation of all



the fringe communities at all levels. The effective involvement of the traditional authority has boosted the confidence of the community members, making them participate in most CREMA activities that bring benefits and ensure effective management of natural resources.

Despite the numerous positive and encouraging trends, several social, economic, and environmental risks remain. The presence of these risks poses challenges to the attainment of sustainability of the CREMAs in the long term.

The Strong belief of CREMA constituents in supernatural forces may make efforts seem futile as these beliefs sought to encourage and foster effortless expectations of ecological replenishment by the gods and ancestors despite excessive resource exploitation and depletion.

The completion in 2009 of the Bui hydroelectric dam downstream the Wechiau CREMA led to increased poaching and a drastic reduction of grazing habitats for the over 300 hippopotami within the Bui stretch of the Black Volta. This caused some populations of hippopotami to migrate upstream to Wechiau. Some sightings were also made upstream in the Zukpiri CREMA, this upstream population was suspected to have moved in from Burkina Faso, which is quite encouraging. These upstream and downstream migrations of hippopotami into the respective CREMAs are a clear indication that the CREMAs of the basin are vulnerable to forces beyond their control, making the CREMAs ecotourism potentials and conservation successes primarily linked to an imperilled species that has uncertain population viability (Sheppard 2010).

Furthermore, the effects of climate change in the years preceding the study have become a major concern to the attainment of sustainability in CREMAs within the Volta Basin. With climate change in the northern part of Ghana hard most especially the Volta basins, there has been an incidence of serious floods that destroyed farmland and wildlife habitats while coursing droughts and disrupting rural economic systems in these basins.



Increasing revenue and infrastructure developments have become status quo and people could become disenchanted if the frequency of new benefits decreases over time (Sheppard et al, 2010).

Like all political systems with powerful authority, future elections among the Wala and Dagaaba chiefdoms in the basin could yield chiefs whose interests are not aligned with the current successes. Poor leadership could result in limited opportunities to express grievances, favoritism for family members, the marginalization of ethnic minorities, ethnic conflict, and inequitable distribution of benefits. Ecosystem deterioration is most likely if chiefs saw advantages in activities such as logging and mining that harm protected habitats. Finally, benefits associated with protected areas may attract migrants (Mutandwa & Gadzirayi 2007) and introduce social, economic, and political pressures which are difficult to predict or control across international borders. Already, Children from Burkina Faso traverse the river and CREMA core zones daily to attend schools in CREMA communities in Ghana. This increases human density within CREMAs which could most likely contribute to the diminishing of the CREMAs environmental integrity.

A continuation of these scenarios could yield profound social, economic, and environmental impacts with the realization of the existence of a tight link between the CREMA's social, economic, and environmental conditions. If not systemically addressed would thwart the expected long-term sustainability of these CREMAs in the basin.

5.3 Recommendations

The study, therefore, recommends that,

- The monitoring of hippopotami Should be carried out simultaneously in all three CREMAs and should be done collaboratively with support from the government through Wildlife division and other organisations should ensure the continuous monitoring and conservation of this very important species



- The Wechiau CREMA has proven that ecotourism around the hippopotami can be of immense socio-economic benefit to the inhabitants of CREMAs in the basin as constituents have tied all developmental activities in the CREMA to the conservation of the Hippopotami. The study, therefore, recommends the identification and development of ecotourism ventures in the other two CREMAs, if not around Hippopotami, but other fauna and flora to help enhance the benefits accrued by CREMAs.
- Being the site with the country's "last remaining hippopotami population" also makes it a hot spot for field schools and research into the ecology of hippopotami and other high-interest species. Designating it as a study site for hippopotami and other fauna and flora by science base institutions will bring positive economic benefit to the CREMAs, region and nation.
- The three CREMAs harbour over 200 bird species with close to 89% of the species appearing to be all-year-round residents. This provides yet another ecotourism opportunity in bird watching. The study recommends to Management of these CREMAs to look to establish a venture around bird watching
- The basin is an important source of non-timber forest products such as Shea nut, locust beans and medicinal plants. Management should consider developing value chains around them to provide constituents with additional livelihoods and contribute to the financing of conservation activities in CREMAs.
- The study also recommends the development and implementation of benefit-sharing plans/schemes by management to help streamline the equitable distribution of benefits. This will boost the confidence of the constituents and motivation towards effective resource conservation.



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APPENDIX 1

Sustainability of Community Resource Management Areas in the Black Volta Basin

Birds Survey Sheet Date:.....

Transect:.....

Coordinates:.....

Identifier:..... Timekeeper:.....

Recorder:.....

Segment	Start Time	Species	Seen	Heard	Notes	End Time



APPENDIX 2
Sustainability of Community Resource Management Areas in the Black Volta Basin

Hippo Monitoring Form

Date: **Start Time:**..... **End Time:**.....

Transect Number/Location:

Team Members:

.....

Start coordinates: Lat.....Lon.....

Time	Fishin g Net	Hipp o Exit	Hippo Sighting				Coordinates		Comments
			M	F	J	UN	Latitude	longitud e	

Recording Key

Nets: AL=along river; X=across river; OTHER=describe in comments section

Hippo Exits: FRESH=last night; ONE DAY=one day old; UNKNOWN=hippo exit age unsure

Hippo Sighting: M=male; F=female; J=juvenile; UN=unknown



APPENDIX 3

Sustainability of Community Resource Management Areas in the Black Volta Basin
Vegetation Sampling-Species Diversity

Date:.....

CREMA.....

Quadrat:..... Centre

Coordinates:.....

Identifier:.....

Recorder:.....

Tree Species						
S/N	Common Name	Scientific Name	Origin (Native/Exotic)	Latitude	Longitude	dbh



APPENDIX 4
UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF INTEGRATED DEVELOPMENT STUDIES

DEPARTMENT OF ENVIRONMENT AND RESOURCE MANAGEMENT

Interview Guide for Community members

Introduction:

The purpose for this study is to fulfill the requirements for the award of Master of Philosophy Degree in Environment and Resource Management, at the Department of Environment and Resource studies, University for Development Studies. The study solicits for data in order to examine the **sustainability of Community Resources Management Areas in the Black Volta basin**. You are assured that responses given will be treated with confidentiality and will be used solely for academic purposes. Kindly answer the questions as objectively as possible.

Thank you.

Section A: Background information

Kindly tick as [√], where appropriate and please provide responses where necessary.

A. Personal Information

I. Indigene [] non-indigene []

II. Sex..... Male [] Female []

III. Age.....

IV. Occupation:.....

V. Marital status: a. Married [] b. Unmarried [] c. Divorced []

VI. Highest level of educational attainment

a. No formal education []

b. Basic []

c. Secondary (S.S.S, Training College, Vocational) []

d. Tertiary (Polytechnic, University) []

e. Others, specify



VII. For how long have you been staying in this town/village?

- a.years
 - b.months
 - c.weeks
 - d.days
-

Section B: History of CREMA

- 1. Can you please give a brief History and Description of the CREMA?
 - 2. Do you know the boundaries of the CREMA?
 - a. if yes, how do you recognise the boundaries?
 - b. if no, why
-

Section C: Basic Governance structures

- 3. Can you recognise all members of your community?
 - 4. Does your community have a CRMC?
 - 5. Do you know which community members form your CRMC? Name them.....
 - 6. What was the criterion used in selecting them?
 - 7. Do you know your CRMC Representatives to the CEC?
 - 8. How were they selected?
-

Section D: Benefits, Costs and Impacts of CREMAS

- 9. In what way did you sacrifice/contribute or is contributing to the development CREMA? Please explain.
 - 10. What benefits have you received from CREMA?
 - a. Are the benefits you receive more, less or equal to your sacrifices /contributions?
-



Section E: Representation and communication

11. Do you get information about the CREMA?
 - a. If yes, how do you get the information?
 - b. if no, why?
 12. Is there equal representation at the CEC between females and males?
 13. Is there equal participation between females and males in the CEC?
 14. Is there equal participation in the CEC between the poor and the rich?
 15. Is there equal participation in the CEC between Indigenes and settlers?
-

Section F: Monitoring of Core Zone

16. Who monitors the core/riparian zone?
 17. Who monitors behavior of users of resources within core/riparian zone?
 18. Who monitors community activities?
 19. Is there financial monitoring?
 20. Who is responsible for financial monitoring?
 21. Is there an external monitoring system?
-

Section G: By-laws and sanctions

22. Does the CREMA have by laws?
 23. How were they formulated?
 24. What activities are you not allowed doing?
 25. What is the magnitude of violation?
 26. Who implements the sanctions upon violation of the bylaws?
 27. Are there any external punishment systems?
 28. How often are the bylaws updated?
-



Section H: Conflicts and Conflict resolution

29. Are there any present or past conflicts?
30. Are there any conflicts between communities within the CREMA?
31. Are there any conflicts between CREMA communities and those outside of the CREMA?
32. Are there any conflicts between individuals or communities with regards to access to resources?
33. Are there conflicts related to decision making and benefit sharing?
34. How are conflicts resolved between?
- a. Individual users?
 - b. Communities?
 - c. Community members and CREMA staff?
-

Section I: Recognition and Rights

35. Has the CREMA been devolved?
- a. if yes, when (can I have a copy of the certificate of devolution?)
 - b. if no, why
36. Are there any restriction from the government on the CREMA?
-

Section J: Stakeholder identification and Analysis

37. Who are the stakeholders or partners to the CREMA?
38. Which of the above mentioned are the major stakeholders?
39. What role does each of the major stakeholders play?
40. Are there external partners to the CREMA?
- a. if yes, what are their contributions
 - b. if no, why



APPENDIX 5
UNIVERSITY FOR DEVELOPMENT STUDIES
FACULTY OF INTEGRATED DEVELOPMENT STUDIES
DEPARTMENT OF ENVIRONMENT AND RESOURCE
MANAGEMENT

Focus group Discussion guide for CREMA Staff and Management

Introduction:

The purpose for this study is to fulfill the requirements for the award of Master of Philosophy Degree in Environment and Resource Management, at the Department of Environment and Resource Management, University for Development Studies. The study solicits for data in order to examine the **Sustainability of Community Resource Management Areas in the Black Volta Basin**. You are assured that responses given will be treated with confidentiality and will be used solely for academic purposes. Kindly answer the questions as objectively as possible.

Thank you.

A. History of CREMA

1. Can you please give a brief History and Description of the CREMA?

B. Relationship between Forestry commission and CREMAS

2. What is the relationship between your CREMA and the Ghana Wildlife division of the forestry commission?

C. Benefits, Costs and Impacts of Conservancies

3. What are the benefits of the CREMA to the Communities? Please explain.

- i. Ecological Services? (E.g. protection of watersheds, cleaner air, etc.)
- ii. Commercial (e.g. collection and selling of renewable natural resources and by-



- products; and marketing opportunities)
- iii. Community Benefits (qualify and quantify)
- iv. Economic Development (e.g. low-impact tourism and cultural tourism)
- v. Extension of development benefits (fringe benefits such as local employment opportunities, environmental awareness and education, training)
- vi. Cultural and Social Benefits? (e.g. traditional and cultural institutions and knowledge)
- vii. Ceremonial and Spiritual Benefits? Recreational Benefits?

4 . Are there sacrifices made or to be made by communities in the establishment of the CREMA?

5. Are there mechanisms for the sharing and/or retention of economic benefits within the CREMA communities?

a.. How are economic benefits dealt with at the community level?

b. What is the role of government in these mechanisms?

c. Are benefits retained at the community or household level? If so, what are they being used for and what is their contribution to the family income?

d. What are the social and cultural impacts of economic development opportunities in the CREMA on constituent communities?

e. What about ecological impacts? Is there an Environment Impact Assessment done for each proposed development activity in the CREMA? (Can I get a copy of the EIA report?)

D. Use Regulation

6. How is the use of natural resources (e.g. hunting, fishing, collection of natural resource products) by CREMA communities regulated? (Are there quotas; park use permits; seasonal restrictions, etc.)

7. Does this differ with wildlife division's social, ceremonial and cultural uses, and other uses?

8. Are there control mechanisms to ensure fairness in the use of natural resources, and compliance with use regulations?

E. Governance and Community Involvement



9. What is the nature of involvement of constituent Communities in CREMA activities, in:
- a. The designation and planning process of the core zone
 - b. The establishment of the CREMA (e.g. boundaries and mapping)
 - c. Participatory Management Planning
 - i. Do you have management plan?(can I have a copy of the most current)
 - ii. What about a business development plan? (e.g. commercial activities) (Can I have a copy?)
 - d. Administrative Structure and Management of the CREMA
 - i. Are there management structures in place? If so, what are the roles and responsibilities of the governing bodies?
 - ii. Are there community-based institutions to co-manage the CREMA and its natural resources?
 - iii. To what level is authority over management of natural resources devolved to the CREMA communities?
 - e. Decision-making processes of the CREMA?
 - f. Stewardship and biodiversity conservation of the CREMA? (E.g. local rangers/volunteer/fire squads for protection of CREMA boundaries)
 - g. Sustainable financing of CREMA?

F. Traditional Ecological Knowledge and Conservation Practices

10. Is there recognition and implementation of traditional conservation practices and natural resource management in the CREMA?

- a. If so, what are these and to what extent are they implemented?

G. Tenureship

11. What is the CREMA's level of authority over land and resources?

What about sub-surface resources (e.g. hydrocarbons, minerals, oil, gas).

- a. How does this relate to the national policy regarding land and resource tenure?
- b. Are there other stakeholders that have user rights within the CREMA?

12. Is Tenureship made clear in the collaborative management of CREMA?

13. Does tenure affect constituent communities' involvement in the CREMA's?



- a. If yes, how so?

H. Regional/District/Community Land Use Planning

14. Was your CREMA established through the implementation of a Regional/District Land and Resource Management Plan?

15. Is there a Land and Resource Management Plan (LRMP) for your district?

- a. Did the CREMA participate in the LRMP process?
- b. Did you have veto rights or decision making power in the establishment of the CREMA?
- c. What are the benefits of the LRMP process for CREMA communities and for government?

16. Are there any relationships between the CREMA and the district/regional planning authorities?

17. What effect does the relationship between CREMA and District/Regional planning authorities have on the CREMA?

- a. Does the relationship assist constituent communities in their ownership and development of the resources within the CREMA?
- b. Did the District/Regional planning authorities identify themselves in the issues of the CREMA?

I. Objectives and Long-Term Vision of CREMA

18. What are the specific objectives of CREMA?

- a. are they understood by government(the District Assembly)? (explain)
- b. constituent communities?(explain)

19. How are these objectives being met?

- a. Social and cultural objectives?
- b. Biodiversity conservation/Ecological objectives?
- c. Economic development and sustainable natural resource use objectives?
- d. Recreational objectives?

20. What is the long-term vision for the CREMA?.....
.....
.....



a. Are government and communities in agreement with regards to this vision?

Yes [] explain

No [], explain

J. Legislation and Conservation Strategies

21. Is there a national legislation on natural resources management that you are aware of.

Yes []

No []

a. if yes, How does community involvement in Natural resource management fit into this national legislation?

K. Awareness and Support

22. Has the establishment of the CREMA resulted in increased awareness of benefits of conservation and natural resource management to:

a. Communities?

b. Policy Makers and Government?

c. Public?

23. Has involvement of communities in Conservation and NRM resulted in support by the community for the CREMAs?

24. Does the community feel that government has provided incentives to the community to be involved in biodiversity conservation?

a. If so, what are these?

b. (if no) what incentives would enable greater community support for biodiversity conservation?

L. CREMA Institutional and Capacity Building

25. Is there sufficient capacity within CREMA to manage the Natural Resource on their own?

26. Is there sufficient capacity within the CREMA for the collaborative management of Natural Resource?

27. Is there a perceived need for capacity development with respect to governance of CREMAs?

28. Is there any other perceived need for capacity building in other areas? (e.g tourism development)



M. Conservancy Policy and Implementation

29. Are there mechanisms to ensure that the objectives of the CREMA are being implemented (monitoring and evaluation procedures)?

30. What are some of the barriers to successful implementation?

N. External Factors

32. Are there other external factors that have an effect on the successful collaborative management of the CREMA? If so, what are these?

O. Sustainability

33. How do you see the CREMA in the next ten years?

33. What steps are taken to ensure continuity in CREMA activities?

34. In your view things, does your current status promise sustainability of the CREMA?
Explain



APPENDIX 6
UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF INTEGRATED DEVELOPMENT STUDIES

DEPARTMENT OF ENVIRONMENT AND RESOURCE MANAGEMENT

Questionnaire for Key Informants

Introduction:

The purpose for this study is to fulfill the requirements for the award of Master of Philosophy Degree in Environment and Resource Management, at the Department of Environment and Resource studies, University for Development Studies. The study solicits for data in order to examine **sustainability of community resources management areas in the Black Volta basin**. You are assured that responses given will be treated with confidentiality and will be used solely for academic purposes. Kindly answer the questions as objectively as possible.

Thank you.

Background information

Kindly tick as [, where appropriate and please provide responses where necessary.

A. Personal Information

1. Indigene [] non-indigene []
2. Sex.... Male [] Female []
3. Age.....
4. Occupation.....
5. Marital status: a. Married [] b. Unmarried [] c. Divorced []
6. Highest level of educational attainment
 - a. No formal education []
 - b. Basic []
 - c. Secondary (S.S.S, Training College, Vocational) []



- d. Tertiary (Polytechnic, University) []
 - e. Others, specify
7. For how long have you been staying in this town/village?
- a.years
 - b.months
 - c.weeks
 - d.days

B. Management/planning Unit

- 8. How is the CREMA physically organised?
- 9. How many management units exist within the CREMA?
- 10. What is the level of management of each unit?

C. Objectives of CREMA

- 11. When was the CREMA established?
- 12. Who established the CREMA?
- 13. What are the objectives of the CREMA?
- 14 Who ensures the achievement of these objectives?

D. Documentation

- 15. Does the CREMA have any CREMA management documents?
 - a. if yes, what documents are available?(can I get copies)
 - b. if no why

- 16.Does the CREMA have a constitution?

Yes [] No []

- a. if yes, how often is it reviewed
- b. if no, why

- 17.Does the CREMA have by-laws?

Yes [] No []

- a. if yes, are the bylaws documented
- b. if no why

- 18.Do you belong to any miners group or association in the community?

Yes [] No []

- 19. How effective are the bylaws?

Not effective [] effective [] very effective []

- 20. How often are the bylaws reviewed?

- 21. When were the bylaws last reviewed?



22. Who ensures adherence to CREMA bylaws?
23. What kind of sanctions are outlined for breakers of the bylaws/
24. Are there external sanctions.
- Yes [] No []
- a. if yes, which agencies are involved
- b. if no, why

E. Monitoring and Evaluation

25. Does the CREMA carry out any monitoring activities?
- Yes [] No []
- a. If yes, what type of monitoring is carried out by the CREMA?
- b. If no why?
27. Which areas do you monitor?
28. Who is responsible for monitoring in the CREMA?
29. How often are monitoring activities conducted?
30. In your assertion, what is the state of the CREMA with regards?
- a. Biodiversity
- b. Human well being
- c. Desire of communities to continue.

F. Benefits and Benefit Sharing

31. Have you realised any benefits since the establishment of the CREMA?
- Yes [] No []
- If yes, what benefits are the benefits realised so far?
31. How are benefits shared in the CREMA?
32. Is the benefit sharing model/scheme equitable?
32. Is the benefit sharing scheme documented?
- Yes [] No []
- a. if yes, is the document followed in the sharing process?(can I have a copy?)
- b. If no, why?
33. Who decides when to share benefits?

G. Employment and Livelihoods

34. How many staff has the CREMA?
- a. how many are permanent (on monthly salary)?
- b. how may are temporal(on commission)?
35. Is there a documented criterion for recruiting staff?



Yes []

No []

a. if yes, what is the criterion?(can I have a copy)

b. If no, how is CREMA staff recruited?

36. What livelihood activities exist within the CREMA?

37. Which of the livelihood activities was initiated and developed by the CREMA?

38. Who are the beneficiaries of the CREMA initiated livelihoods.

39. How are beneficiaries supported?

40. How are these livelihood ventures sustained?

