

جامعة أبو بكر بلقايد
UNIVERSITÉ DE TLEMCEM



Pan African University
Institute of Water
and Energy Sciences

PAN AFRICAN UNIVERSITY

Institute of Water and Energy Sciences (Including Climate Change)

Master Dissertation

Submitted in partial fulfilment of the requirements for the master's
degree in

Water Policy

Presented by

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Measuring the Water Governance Efficiency of the Upper Blue Nile River Basin

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A Research study submitted to the Pan African University Institute of Water and Energy Science, including climate change department of Water Science in Partial Fulfilment for the Requirements of the Degree of Master of Science in Water Policy

DECLARATION

I, Kwabena Fynn Fletcher, hereby declare that this thesis represents my personal work, realized to the best of my knowledge. I also declare that all information, material and results from other works presented here, have been fully cited and referenced in accordance with the academic rules and ethical conducts.

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DEDICATION

I dedicate this project to my family, my source of inspiration, hope and fulfilment.

ACKNOWLEDGEMENTS

My deepest gratitude goes to Almighty God who has provided me all that was needed to complete this research project.

I sincerely appreciate my supervisor Dr. Azage Gebreyohannes whose contribution and constructive criticism has pushed me to expand the kind of efforts I have exerted to make this work as original as it can be. Thanks to him I have experienced true research and my knowledge on the subject matter has been broadened.

My special appreciation goes to the African Union Commission and Pan African University Institute of Water and Energy Science for providing me a research grant that has enabled me to take the bold decision to do my research in Ethiopia. This work would have been unimaginable without the financial support

Similarly, I would like to thank all those institutions and persons who assisted me in Ethiopia. My sincere thanks to Dr Bayou Chane Tegegne, Director of the Ethiopian Institute of Water Resources, Addis Ababa University, for housing me at the institute for the whole duration of my stay in Ethiopia.

My utmost gratitude goes to Mr Fekamhed Negash for giving me an internship opportunity at the Eastern Nile Technical Regional Office (ENTRO) where I had access to their library, an office, free internet and free coffee. I cannot forget to thank Dr Wubalem Fekade for his professional advice and his friendship.

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ABSTRACT

The Nile Basin is shared by eleven riparian countries and is the lifeline for more than 238 million people living in the basin. The Nile water has been crucial for upstream and downstream users with competing needs such as irrigation, domestic water supply, hydropower, industry, and other ecosystem services. These competing needs are severely compromised by soil erosion in the upstream part of the basin and siltation of reservoirs and irrigation canals in the downstream portion of the river reach. Climate and land-use changes and poor land management are other biophysical challenges to the water resources in the basin. It is, therefore, generally agreed that proper water governance is needed to remedy this situation. The study consequently measured the water governance efficiency of the Upper Blue Nile river basin in Ethiopia. Measuring water governance efficiency is essential because if we cannot measure it, we cannot improve the system. The study adopted a mixed-methods approach using survey questions and semi-structured interviews to gather perceptions and expert opinions, respectively. By using Statistical Package for Social Sciences, and thematic analysis on Microsoft Excel, the water governance efficiency of the river basin was estimated. The analysis determined the water governance efficiency at about 68 per cent. The study concluded that water governance of the basin was relatively good, considering the broader governance context of Ethiopia. However, several efforts need to be made to increase institutional capacity on the basin for better governance; it includes capacity building, political commitment, coordinated decision making by all sectors, among others.

Keywords: Water Governance, Blue Nile, Efficiency, River Basin, Hydro politics, Ethiopia.

ABSTRAIT

Le bassin du Nil est partagé par onze pays riverains et constitue la bouée de sauvetage de plus de 238 millions de personnes vivant dans le bassin. L'eau du Nil a été cruciale pour les utilisateurs en amont et en aval ayant des besoins concurrents tels que l'irrigation, l'approvisionnement en eau domestique, l'hydroélectricité, l'industrie et d'autres services écosystémiques. Ces besoins concurrents sont gravement compromis par l'érosion des sols dans la partie amont du bassin et l'envasement des réservoirs et des canaux d'irrigation dans la partie aval du cours d'eau. Les changements climatiques et d'affectation des sols et la mauvaise gestion des terres sont d'autres problèmes biophysiques pour les ressources en eau du bassin. Il est donc généralement admis qu'une bonne gouvernance de l'eau est nécessaire pour remédier à cette situation. L'étude a donc mesuré l'efficacité de la gouvernance de l'eau du bassin du Haut-Nil Bleu en Éthiopie. Mesurer l'efficacité de la gouvernance de l'eau est essentiel, car si nous ne pouvons pas le mesurer, nous ne pouvons pas améliorer le système. L'étude a adopté une approche de méthodes mixtes utilisant des questions d'enquête et des entretiens semi-structurés pour collecter des perceptions et des opinions d'experts, respectivement. En utilisant le paquet statistique pour les sciences sociales et l'analyse thématique sur Microsoft Excel, l'efficacité de la gouvernance de l'eau du bassin fluvial a été estimée. L'analyse a déterminé l'efficacité de la gouvernance de l'eau à environ 68%. L'étude a conclu que la gouvernance de l'eau dans le bassin était relativement bonne, compte tenu du contexte plus large de la gouvernance en Éthiopie. Cependant, plusieurs efforts doivent être déployés pour accroître la capacité institutionnelle du bassin en vue d'une meilleure gouvernance ; cela inclut le renforcement des capacités, l'engagement politique, la prise de décision coordonnée par tous les secteurs, entre autres.

Mots-clés : gouvernance de l'eau, Nil Bleu, efficacité, bassin hydrographique, politique hydroélectrique, Éthiopie.

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LIST OF ABBREVIATIONS AND ACRONYMS

EiWR	Ethiopian Institute of Water Resources
ENTRO	Eastern Nile Technical Regional Office
GWP	Global Water Partnership
IWRM	Integrated Water Resource Management
MDG	Millennium Development Goals
NBI	Nile Basin Initiative
NGOs	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social science
UNDP	United Nations Development Programme
WGI	World Governance Indicators
WRI	Water Resource Institute
WWV	World Water Vision

CHAPTER ONE

1. INTRODUCTION

1.1. Background

There is a consensus that the world is currently in a global water crisis. However, this crisis is not quantity, but rather a crisis of management and accessibility (UNDP & Water Integrity Network, 2013). Poor resource management, corruption, lack of appropriate institutions, insufficient capacity and a shortage of new investments undermine the active management. This situation is one of the problems that necessitated the formulation of the Millennium Development Goals (MDGs) and its successor, the Sustainable Development Goals (SDGs). Much attention has been drawn to water governance as one of the most critical areas to propel the sustainable development of water resources in order to respond to this global water crisis. However, the global water community, for two reasons, has not advocated for global coordination in water governance. First, global coordination seems to negate the principle of subsidiarity, which recommends the handling of water issues at the lowest level of governance possible. Secondly, in a closed ecological system, global water resources are available, because aggregate annual water withdrawals are and will remain below annual renewable water resources at the global level (Vörösmarty et al., 2000; Shiklomanov, 2000; Zehnder et al., 2003).

Consequently, the international community has recognised state-centric approaches to water governance. However, most developing countries face significant challenges in implementing their newly developed water laws. Many of these policies contain the same old, similar goals, such as decentralisation, private sector participation, basin-wide management planning, and better coordination of decision-making and multi-stakeholder participation. However, while sound policies have been created on paper, many encounter problems that prevent the formation and proper functioning of governance structures. These problems arise because policies are basically selected options to be used as instruments for achieving intended goals and objectives and as such, they serve only as a general and directive principle on a broader scope and therefore do not consist of any elaborated action plans.

1.2. **Defining water governance**

Water Governance is defined by the GWP (2002) as "the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society. The UNDP Water Governance Facility (2013) instead offers a more nuanced and specific definition. It contends that water governance should tackle principles such as equity and efficiency in the administration, allocations and distribution of water resource and services based on integrated water management approaches and the need to create a balance between all the competing uses of water and ecosystems. It also advocates the "clarification of the functions of government, civil society and the private sector and their roles regarding ownership and management and administration of water resources. Biswas and Tortajada (2010) argue that the phrase water governance has replaced the concepts such as 'sustainable water management' and 'integrated water resources management' (IWRM), the two dominating paradigms up until the 2000s. Tropp (2007), on the other hand, defines water governance in terms of the "evolution of formal and informal networks, partnerships, joint- decision-making processes including dialogue and negotiated outcomes as mechanisms for steering water governance." Wiek and Larson (2012) summarise water governance as a systemic perspective, governance based on social actors, open and accessible discourse on values and goals, and an all-inclusive perspective on water sustainability.

1.3. **The Components of Water Governance Assessment**

Unfortunately, there is no one-size-fits-all governance model for water since every country has its unique set of governance systems, institutional structures and stakeholder dynamics and hence faces different problems and priorities. This implies that there are no perfect solutions, but only ones that work in particular contexts (UNDP & Water Integrity Network, 2013). However, three factors have been identified as critical components that make up a water governance assessment framework. These components offer an applicable but straightforward analytical framework that can be used to design and contextualise assessments in the water sector. They include (a) Actors and institutions, (b) governance principles and (c) performance.

1.4. **Actors, institutions and stakeholders**

This is a framework to examine particular actors, water institutions and stakeholders, including their specific interests, capacities and the power dynamics between them. The rationale of such scrutiny is to build an understanding of how water governance fits within the broader context of governance and the political economy of a particular country. Institutions in this context encompass both formal and informal 'rules of the game' that determine how water is governed. Formal, or in legal terms statutory, institutions exist at many different levels and can have a direct and indirect impact on water governance. A clear example of a formal institution is a national constitution, which provides the basis for all other laws, rules and regulations in a state. For example, the Federal Republic of Ethiopia provides for the public ownership of land and all-natural resources (including water). Informal water institutions, on the other hand, refer to traditional and contemporary social rules and norms that decide on water management, use and allocation. These can institutions usually manifest in the form of community-based organisations, the local private sector and religious associations, among other groups. In other words, the norms and traditions of how to allocate, distribute and use water resources. Some shares of Ethiopia's water resources are allocated based on customary water rights. Small-Scale farming is still a principal occupation in the Upper Blue Nile river basin, and it is reasonable to think that a large share of the water resources being used in irrigation falls outside the regulatory control of the government. However, this does not suggest that water resources are unregulated, since farmers may agree among themselves on how to use and manage water resources. Formal and informal institutions have the potential to form a compatible overall governance system that can effectively steer the management of water resources (UNDP & Water Integrity Network, 2013).

Furthermore, if institutions are the 'rules of the game', stakeholders are the actors who respond to these institutions. There is no clear-cut method to determine who is a stakeholder in water governance. However, at the local level, many entities are involved in water decision-making: farmers' organisations and unions, NGOs, community leaders and local entrepreneurs, among many others. External stakeholders also play a significant role in developing countries, including Ethiopia, in water governance. They include donors, multinational water companies, foreign policy actors, international lending institutions and even states (in areas of transboundary water resources). Since many different actors are involved in water governance, understanding how these different stakeholders interact, the power relations between them, and how they influence policy is necessary for gauging water governance in any area.

1.5. Governance principles

Governance principles such as, accountability and participation and transparency create incentives that influence how actors, institutions and stakeholders interact. Transparency International (Transparency International, 2018) defines transparency as "shedding light on shady deals, weak enforcement of rules and other illicit practises that undermine good governments, ethical businesses and society at large". Transparency is concerned with how open governance processes are as well as access to information. It also refers to the degree to which public decision-making processes and outcomes are open to scrutiny by the public. Accountability refers to sets of controls and oversights that ensure officials and institutions give justification for their actions (Stapenhurst & O'Brien, 2006). In the water sector, accountability mechanisms can elucidate the roles of actors involved in water governance, place checks on their actions as well as protecting water resources (UNDP & Water Integrity Network, 2013). Participation, on the other hand, is involved with creating the opportunity for citizens to give informed, timely and meaningful contributions and to influence decisions at various levels of government (UNDP & Water Integrity Network, 2013). Participation may be in the form of private sector participation, stakeholder participation and public participation. The rationale for public participation in the water sector assists decision-makers in understanding and identifying public concerns while formulating water policies. Unfortunately, however, participation in the sector has been more often than not passive (Razzaque, 2009). For the last few years, conscious efforts have been made to focuses on active participation by organised groups, communities, and the general public (Rogers & Hall, 2003).

1.6. Water Governance of the Upper Blue Nile River Basin

The Blue Nile is the principal tributary river of the Nile. With a total area of about 200,000 square kilometres, it covers about 20% of the country's landmass and serves as the lifeline for about 25% of the population (Erkossa, Awlache, Haileslassie, & Deneke Yilma, 2009). The upstream part of the Blue Nile, the Upper Blue Nile Basin, which is commonly referred to as Abay is one of the most important river basins in Ethiopia. This basin contributes about 40% of agricultural products and 45% of the surface water of the country. It provides 62% of the flow at Aswan in Egypt (Dile et al., 2018). Therefore, the proper governance of this river basin

has been of great interest to Ethiopians as well as to Sudan and Egypt. However, institutional challenges coupled with the temporal and spatial variability of resources on the basin, climate change, land degradation, rapid population growth and resultant low agricultural production and poverty are hampering the sustainable governance of the basin (Erkossa, Awlache, Hailelassie, & Deneke Yilma, 2009). This, therefore, calls for ways to improving institutional capacity to ensure that these challenges are resolved. However, improvement cannot be made without measurement, and so this study will measure water governance efficiency of the Upper Blue Nile River basin and then explore ways of improving governance.

1.7. Problem Statement

The World Water Vision (WWV) Report attributed the water insecurity situation in developing countries to lousy governance, wrong incentives, and inadequate allocations of resources (Cosgrove, Rijsberman, & World Water Council., 2000). As a result, there has been a consensus that improving water governance holds the key to solving this menace. However, the performance of most organisations and institutions set up to facilitate water resources management in Africa remains unsatisfactory (Houdet & Chikozho, 2015). Therefore, measuring the water governance efficiency of water governing institutions is important because if we cannot measure it, we cannot improve the system. It is from this background that this study is established to measure the water governance of the Upper Blue Nile River Basin in Ethiopia.

1.8. Research Questions

In order to produce a clear foundation for this research project, and considering the above statement of the problems, the following three sub-questions have been developed for further explorations of the water governance efficiency of the Upper Blue Nile River basin

1. What are the challenges of water governance on the upper Blue Nile river basin?
2. What is the water governance efficiency of the Upper Blue Nile River Basin of Ethiopia?
3. How can institutional capacity be improved on the upper Blue Nile river basin?

1.9. Objectives of the Study

1.9.1. General objective

To define and measure appropriate water governance efficiency of the Upper Blue Nile river basin that enables appropriate planning, management and sustainable use of shared water resources.

1.9.2. Specific objectives

1. To identify the challenges of water governance on the Upper Blue Nile river basin.
2. To measure the water governance efficiency on the Upper Blue Nile river basin.
3. To increase institutional capacity on the river basin.

1.10. The rationale for the study

The world water community over the last decade generally agree that improving water governance is the panacea to solving water insecurity in developing countries (Araral & Wang, 2013; Biswas & Tortajada, 2010; GWP, 2000; OECD, 2006; Rogers & Hall, 2003; Saleth & Dinar, 2005; Verkerk, Hoekstra, & Gerbens-Leenes, 2008). The increasing interest in water governance approaches such as integrated water resources management (IWRM) places further demands on monitoring and assessment tools. IWRM has also advocated for a shift from only monitoring hydrological data to scrutinising data related to policy procedures. Yet data collection and assessment and monitoring systems are areas that are neglected or underdeveloped by many governments. The challenge of developing countries is that increasing government expenditure seems to be the only solution to improving the water sector. Therefore, the trend is the increasing budgetary allocations to the water sector. However, a study by Hauner and Kyobe (2008) revealed that higher government expenditure in any sector in relation to GDP tends to be associated with lower efficiency in the respective sector. Therefore, how do we improve water governance? The first step will be to measure or assess the level of water governance before the system can be improved. This is where the study draws its relevance. It seeks to measure the governance of the Upper Blue Nile river of Ethiopia to enable appropriate planning, management and sustainable use of shared water resources. The findings of this study will not only contribute to knowledge but also benefit the practitioner. Measurement is the first

step to trigger changes that are necessary to improve sector performance by exposing where interventions would have the most impact.

1.11. The scope of the research

This study is focused on assessment and investigation of the water governance efficiency and capability of the Upper Blue Nile River. By the river basin, we mean both surface and groundwater of the Upper Blue Nile catchment. The challenges of water governance of the Upper Blue Nile river basin are examined. The study measures the water governance efficiency of the basin using indicators composed of governance functions and governance principles. Thirteen indicators were selected in all. The study identified and examined the performance of those institutions. (Are they achieving what they were set up to do?). Since the domain of water institutions is the intersection between public policy, economics and law, and are also strongly affected by factors such as resource endowment, demography, and science and technology, the approach is interdisciplinary in orientation and analytical in character. However, the emphasis was not placed on the institutional arrangements on water governance in the river basin. The selected indicators were only appraised at the water sector level. The term 'water sector' includes all its subsectors such as irrigation, domestic water supply, recreation, among others. Finally, the study was limited to the areas of the Upper Blue Nile river basin within the territories of the Federal Republic of Ethiopia.

1.12. Conceptual framework

The conceptual framework serves as the basis for understanding the causal or correlational patterns of interconnections across events, ideas, observations, concepts, knowledge, interpretations and other components of experience (Svinicki, 2010)

The conceptual framework below shows the relationship between the dependent variable (Water Governance) and the dependent variables as well as intermediate variables (performance indicators).

Figure 1 1: Water governance efficiency framework for the Upper Blue Nile River Basin

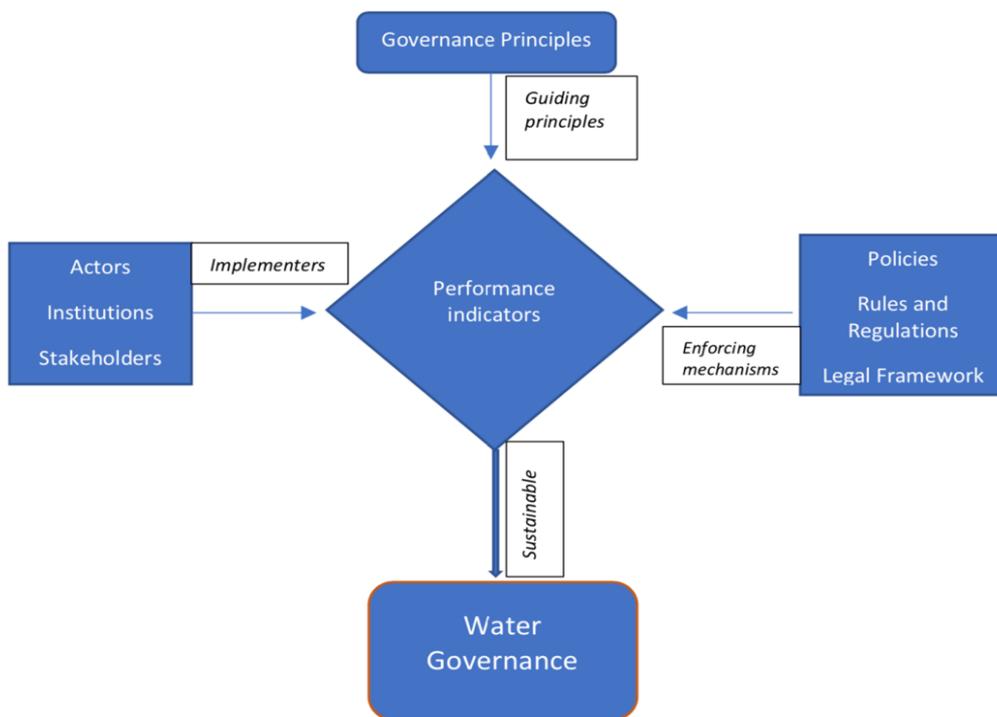


Figure 1-1: Water governance efficiency framework for the Upper Blue Nile River Basin

1.13. Chapter Outline

In terms of structure, this study is divided into five chapters. The first chapter is the introductory chapter that gives a detailed background to the study, the statement of the problem, the research objective, research questions, and scope of the study. It also encompasses the organisation

structure of the study. Chapter Two focused on reviewing relevant literature in the field of water governance in general and that of the Nile River Basin in particular. In Chapter Three, the proposed methodological framework within which the study is carried out is presented. Chapter Four is the chapter where all findings are presented without any interpretation. It is in this chapter that the governance efficiency factor is presented. The fifth chapter pays attention to the analysis and discussion, focusing on interpreting the data and how it fits into the general literature. Finally, the sixth chapter summarises the principal findings from the analysis as well as provide some policy and academic recommendations, and conclusion

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

This is the second section of the study and literature on water governance in general, as well as water governance on the Blue Nile. This chapter aims to examine past research and findings in water governance, research gaps, as well as how this work fits into the general literature. The chapter focuses on the theoretical review, empirical review and concludes with a summary of the literature.

A variety of theories are used to measure water governance in different cultural, social, economic, and political contexts. Paralleling the variety in theories, a range of approaches are also used to develop the methodologies needed to select indicators that correctly measure water governance in theoretical and empirical contexts. The significance of these approaches and methodologies varies with the nature of the river basin, water governance institutions, the focus of the analysis, and the evaluation context (Saleth & Dinar, 2005).

To accurately measure water governance, a basic understanding of the approaches employed by other scholars is essential. This chapter is an attempt to give an analytical overview of these approaches used by scholars. Against this overview, the chapter also attempts a methodological review of the analytical and empirical literature dealing with governance indicators both in general and in water sector contexts. The review is intended to justify the study by identifying some severe gaps in the literature and situating this study in the broad water governance research carefully.

2.2. Approaches to the study of water governance

Just like there is no agreement on the definition of water governance, there seems to be no clear-cut approach to the study of water governance. (Araral & Wang, 2013) Some scholars have approached the subject from their disciplines such as political science, sociology, behavioral science, economics, institutions, international relations, natural resource management, among others. They have examined issues related to efficiency, **accountability, equity, participation,**

sustainability and, integration. Some scholars have also called for a global approach to water governance, while the majority call for a watershed level approach.

2.2.1. Global approach to water governance

Although promoting good water governance is regarded as a global challenge, most state actors generally regard it as a local or regional issue. Usually, where water issues transcend borders of local communities, the river basin is regarded as the best unit for analysis, planning and institutional arrangements (GWP, 2000). As a result, several efforts are made to seek proper institutional arrangements at a local or river basin level.

Internationally, the water community, for two reasons, has not acknowledged the necessity of global coordination in water governance. The first reason is that coordination at the global level seems to negate the subsidiarity principle, which advocates for the handling of water issues at the lowest governance level possible (Verkerk et al., 2008). Secondly, global water resources are will continue to be available, because it is estimated that aggregate annual withdrawals remain below yearly renewable water resources at the global level (Shiklomanov, 2000; Vörösmarty et al., 2000; Zehnder et al., 2003

Hoekstra (2006) argues, however, that water governance does have a global element. The salient factors that give water governance a global outlook include climate change privatization of drinking water, sanitation and irrigation services, increasing 'virtual water trade' between nations (the trade-in water virtually embedded in traded goods and services) interbasin water transfer and water as a geopolitical resource.

A global approach to water governance is, therefore, necessary because state-led institutional efforts have not resolved the effects of climate change, privatization of water and trade liberalization that is leading to the changes in water demand and supply in some parts of the globe (Hoekstra, 2006)

2.2.2. Political Sociology approach

Mollinga (2008) in examining water politics and development, employs a political sociology approach to the study of water governance and argue that water governance is a politically contested domain. She argues that water resource management is inherently political, and the

idea must be established since it is not a generally accepted perspective. While this approach may expound on the relevance of social theory in water governance, it does not say much about politics per se particularly the contrivances that breed water conflicts, resolution mechanisms and their implications for efficiency and sustainability (all which are indicators of good water governance) (Araral & Wang, 2013). Also, Hirsch (2006) advocates that watershed governance (in this case in the Mekong) should be regarded as "an arena for negotiating more sustainable, equitable, and productive use and management of water at multiple scales." Similar to the political sociology approach, Stein et al. (2011) applies a social network analysis in the examination of the structure of the water governance network in Tanzania. Their study concluded that social network analysis "can serve as a tool to create an enabling environment for building networks towards the creation of the locally established institution."

2.2.3. **Comparative approach**

Several organizations such as the World Governance Indicators, Political Risk Services, Economist Intelligence Unit and Freedom House use the comparative approach in measuring governance across countries or sectors in the same country. Perhaps this has influenced the adoption of the comparative method in the study of water governance recently. For example, Saleth and Dinar (2005) uses a comparative approach to compare water governance indicators among countries based three sets of indicators (water law, policy and administration) and 20 sub-indicators that are commonly discussed in the literature.

It is generally acknowledged that country-specific analysis usually is more useful for international organizations and policy formulators because they provide a context-based analysis of issues on the ground. However, comparative approaches are gaining popularity because they reveal cases of 'best practice', which in turn are particularly noted for revealing motivations for institutional change (Saleth & Dinar, 2005). Evaluation of cross-country experience in the water sector and its institutional arrangements are valuable on at least two counts: firstly, knowledge base created from comparative experience allows countries to learn and adapt from mutual experience with minimal uncertainty. It also helps international funding agencies to develop and perfect their national and global institutional initiatives to improve water sector performance (Saleth & Dinar, 2005)

2.2.4. Behavioral approach

The behavioral approach is one of the dominant approaches in the social sciences research and analysis. Perhaps behaviorism has been used to explain water governance because of its easy applicability to real-world examples. In this regard, some scholars who study global water governance have taken a behavioral approach. For example, Pahl-Wostl et al. (2008) define global water governance as "the development and implementation of incentives, norms, principles, rules, informative tools, and infrastructure to promote a change in the behavior of actors at the global level of water governance." This definition places human behavior at the center of water governance.

Similarly, Araral & Wang (2013) argue for a research agenda, that pays more attention to the study of incentive structures. They illustrate how theories from the behavioral sciences such as apolitical economy public economics and public administration can aid in diagnosing incentive issues associated with water governance. They argue that these analytical instruments can complement the methods proposed Biswas and Tortajada (2010) and y Saleth and Dinar (2005) to advance the study of water governance (Araral & Wang, 2013).

2.3. Indicators of water governance

The OECD Inventory of Water Governance Indicators (2015) recognizes about for score studies providing water governance indicators. Some are related to the sustainability of water systems, while others focus on databases, assessment instruments and service provider performance. This section delves into the literature on the indicators used to measure water governance. However, the discussed indicators may not be specific to water governance but for governance in general.

2.3.1. World Governance Indicators

One of the earliest attempts to measure governance (in general) has been the Worldwide Governance Indicators (WGI) project, and related analytical issues by Kaufman, Kraay and Mastruzzi (2010). The WGI cover over 150 countries, measuring six dimensions of governance since 1996: Voice and Accountability, Government Effectiveness, Control of Corruption, Political Stability and Absence of Violence/Terrorism, Rule of Law and Regulatory Quality.

The aggregate indicators are derived from several hundred individual variables, taken from a wide variety of existing data sources. These indicators are derived from over a hundred variables based on 31 different data sources, capturing governance perceptions collected by survey respondents, non-governmental organizations, commercial business information providers, and public sector organizations worldwide.

2.3.2. World Governance Institute Indicators

One initiative by the World Resources Institute, establishes a set of sixteen policy indicators and fifteen regulatory indicators, focusing on social and environmental impacts of processes (Dixt, t. al., 2007). In this approach to institutional effectiveness, there are four to eight-t element driving each governance indicator. For example, the "Effective functioning of the legislative committee" indicator is evaluated in terms of eight elements: (1) disclosure of interests, (2) active committee, (3) reasoned reports, (4) proactive committee, (5) public consultations, (6) transparency of submissions to committee, (7) transparency of committee reports, and (8) reporting by executive.

2.3.3. OECD Water Governance Initiative

Perhaps the most comprehensive set of studies related to water governance has emerged from the OECD Water Governance Initiative (WGI). The work identified twelve principles for good water governance that promote effectiveness, efficiency, and trust and engagement; these principles would apply to all infrastructure sectors: The OECD framework captures most of the elements affecting sector performance that were identified in the other approaches summarized above. The OECD indicators include Regulatory Frameworks, stakeholder engagement, policy Coherence, monitoring/evaluation and water basin scales, innovative governance, clear roles and responsibilities, financing, and integrity/transparency as well as data and information.

2.4. Gaps in the literature

Several remarks can be made about the literature. Apart from the lack of consensus on the scope and definition of water governance, scholars have approached the subject from the interdisciplinary orientations such as political science, institutions, behavioral science,

economics, sociology, among others. They have focused on issues related to efficiency, equity, integration, sustainability and participation, but seldom examine their trade-offs.

Even though the water sector is affected by other sectors, research in the area has not evolved into a multi and interdisciplinary agenda. Approaches from economics, sociology, politics and public administration are rarely brought together to analyze water issues.

Thirdly, there are no agreements the approaches to adopt for the study of water governance. Some scholars such as Saleth and Dinar (2005) employ a comparative approach, comparing water governance indicators among countries based on three sets of indicators (water law, policy and administration) and 20 sub-indicators that are commonly used in the literature. Some scholars s such as the likes of Biswas and Tortajada (2010) propose an alternative approach built on independent and objective case studies of good practices of water governance.

Finally, there are still no generally accepted indicators to measure water governance. The study, therefore, reemploys an interdisciplinary approach to measure water governance in the upper Blue Nile river basin. Based on the gaps identified, a combination of government functions and principles will be carefully selected to serve as measuring indicators of water governance.

2.4.1. Water governance efficiency and capability

Water governance is defined as the broad range of political, social, environmental, economic and administrative systems that are in place to regulate the development and management of water resources and provision of water utility r services at different levels of society (UNDP, 2005). Therefore, understanding and measuring water governance efficiency factor is vital to set up and improve an acceptable water charging system. Measuring water governance is essential because if we cannot measure it, we cannot improve the system.

Water governance performance is determined by estimating how effectively a regulatory system responds to challenges, and institutional performance enhancer elements such as accountability, policy coherence, stakeholder participation, transparency, and the capacity for information management (Berg, 2016).

The Ethiopian Water Resources Management Proclamation (Proclamation No. 197/2000) ensures that the water resources of the state are protected and utilized for the highest social and economic benefits of the people. It also mandates authorities to follow up and ensure that water

resources are duly conserved, ensure that the harmful effects of water are prevented, and that the management of water resources is carried properly.

Considering literatures from (UNDP, 2005; Berg, 2016; Dixt, et. al., 2007; Neto et al., 2018; OECD, 2006; Rogers & Hall, 2003) and various other literature as well as field visits conducted in Upper Blue Nile River Basin, the student has identified and adapted the following ten indicators, shown in Table 2.1, below, to analyze the water governance efficiency and capability.

Table 2.1: Water Governance efficiency analysis indicators

Indicators	Governance Efficiency Indicators Descriptions
Transparency	Decisions on water governance (financial, technical and socioeconomic issues - planning, investment and implementation on water resources development and management) are taken; Enforcement is done following rules and regulations; Information is freely available and directly accessible in easily understandable forms and media to those who are concerned.
Access to justice	Access to grievance or complaint handling mechanism in the basin water management system exists including appeal procedures to the court or other administrative tribunals in case stakeholders are aggrieved by the decisions of grievance handling office or committee (modern or traditional).
Efficiency	Clear and achievable objectives exist with measurable impacts and results that ensure efficient water use system in the basin throughout the regulatory process (Technical, management and financial capability).
Participation	Water users in the basin are directly involved in the development, planning and decision-making process that affects their water use right.

Indicators	Governance Efficiency Indicators Descriptions
Accountability	Decision-makers and water professionals in the basin are accountable to the public and stakeholders for maladministration.
Responsiveness	Water institutions and the governance process in the basin water management system are open and responsive to the water users concerns.
Equitability & water ethics	The existing system of water management in the basin allows all men and women to the equitable and ethical (environmental, economic, social and cultural ethics) water resources utilization.
Sustainability	The water use, management and development system in the basin is functioning sustainably. Effective conservation, operation, maintenance and access to water resources for current and future generations exist.
Coherence & Integration	Consistent and integrated water management, planning and implementation system and practice in the basin exist.
Conflict management	Mechanism and practices of addressing water conflicts that face stakeholders in the basin exist.
Awareness	Water users in the basin know and are aware of the institutions responsible for water governance in the river basin.
Water Allocation	It is easy to get water permits and licenses. Access to water resources in the basin follows an established due process that is known by all.
Capacity building	There is s building of awareness of water issues and priorities as well as coordinated decision making.

2.5. **Chapter summary**

This chapter presented the literature review on water governance. The reviewed literature mainly focuses on identifying the existing knowledge and gaps identified in the areas of water governance, approaches to its studies and the indicators used to measure it. The core gaps identified are that: (1) there is still no consensus (2) there is no one single approach to the study of water governance and (3) there are still no generally accepted indicators to measure water.

CHAPTER THREE

3. METHODOLOGY

3.1. Introduction

This chapter discusses the methodology adopted for the study. It highlights all the methods and techniques applied, including preparation of the research questionnaires, data collection processes, a description of the population and sampling data and data analysis.

3.2. Study area

This study is conducted on a shared river basin located in Ethiopia, the Blue Nile river basin. The Upper Blue Nile River Basin is the source of the water for hundreds of millions of people in Ethiopia, Sudan and Egypt. Specifically, the study considers the Upper Blue Nile river basin which originates from Lake Tana located at north-west highlands of the country, 12 00'N, 37 15'E. The Blue Nile is the principal tributary river of the Nile. With a total area of about 200,000 square kilometres, it covers about 20% of the landmass of Ethiopia and serves as the lifeline for about 25% of the population.

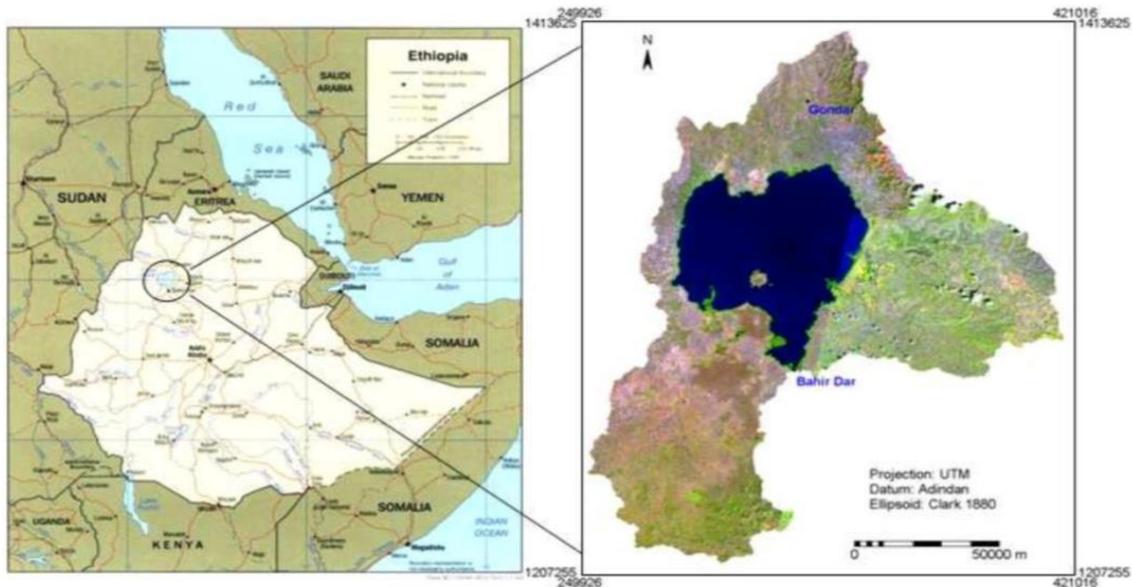


Figure 3-1: shows map of Ethiopia and Lake Tana, the origin of the Upper Blue Nile river (Erkossa et al., 2009)

The upstream part of the Blue Nile, the Upper Blue Nile Basin, which is commonly referred to as Abay is one of the most important river basins in Ethiopia This basin contributes about 40%

of agricultural products and 45% of the surface water of the country. It provides 62% of the flow at Aswan in Egypt, making it one of the most important rivers to Egypt's water security.

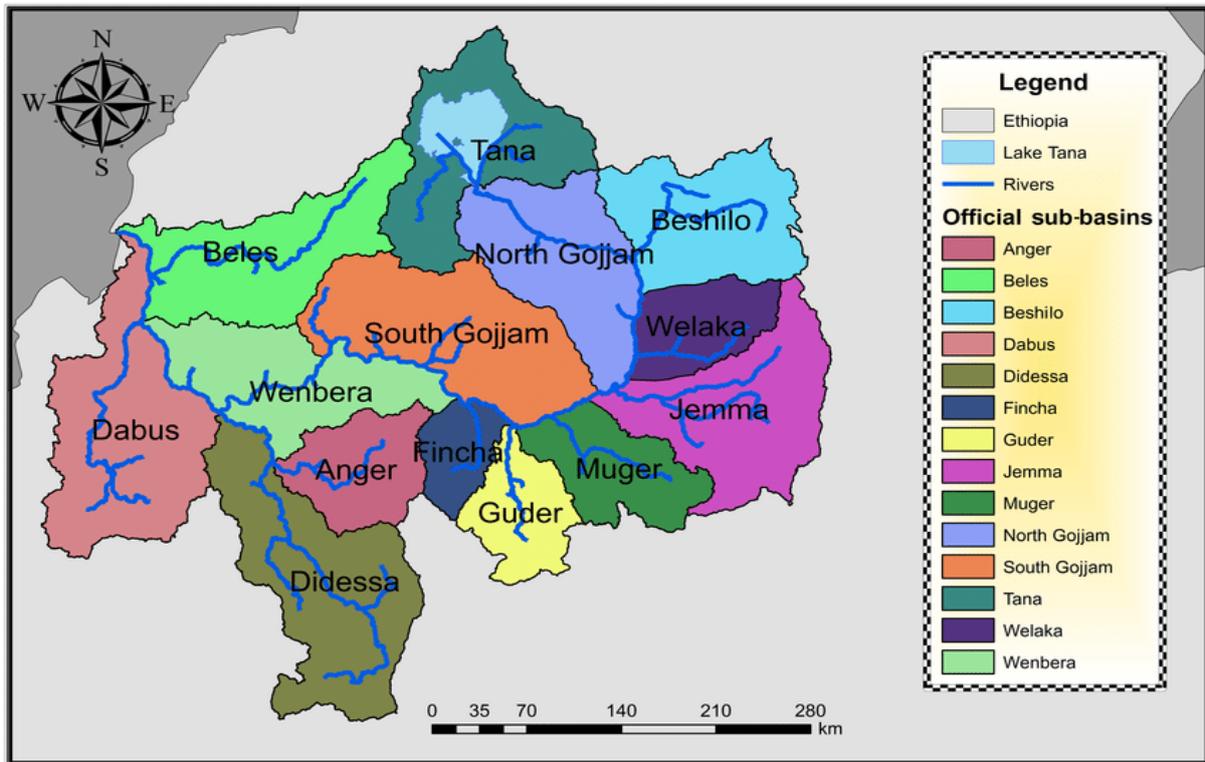


Figure 3-2 GIS representation of the Upper Blue Nile and its sub basins (Polanco, Fleifle, Ludwig, & Disse, 2017)

3.3. Water governance structure

The Blue Nile basin is increasingly experiencing multi-dimensional pressures, including deforestation, population growth, climate change and variability, land/soil degradation, as well as increasing upstream-downstream tension on water use rights. The principal water governing body of the Upper Blue Nile basin is the Abay Basin Authority located in Bahir Dar, the location of the Lake Tana. The Authority is functioning under the Ministry of Water, Irrigation and Energy of Ethiopia. However, the basin water governance system and institutional arrangement is rather a simple one for such an essential and complex river basin in Africa.

3.4. Sources of Data and gathering techniques

The study relied on primary data collected by the student through interviews and survey questionnaire. Secondary data, literature reviews and other sources were consulted to validate the data and, in some cases, help the student understand the findings.

The quantitative primary data sources were based on perceptions-based measuring of governance efficiency, taken from surveys of households and firms. This decision is driven by the view that perceptions data have particular value in the measurement of governance (Kaufmann, Kraay, & Mastruzzi, 2010). First, perceptions matter because people base their actions on their perceptions, impression, and views. Second, in many areas of governance, only perceptions matter. The collection techniques will include but not limited to the use of interviews and questionnaire. The governance efficiency indicators were identified via secondary data that was mined from published articles, policy documents, government and individual reports. Other sources included the World Governance Indicators and Afrobaromtre.

3.5. Sample size and sampling techniques

The quantitative study commenced with a sample size of 40 respondents for the survey questionnaire that was analysed using SPSS and MS-Excel analysis tools. The qualitative technique was used for the interviews with a total of 10 key informants interviewed. In qualitative data collection, it is ideal to interview between 5 and 25 respondents in order to get reasonable information. However, because the zigzag approach was used, only ten interviews were administered before the sample was saturated. This is why the student decided to interview ten key informants. Moreover, issues of water governance are sometimes political, and it was difficult finding well-informed respondents.

With regards to the sample techniques, purposive sampling was used for the interviews because water governance is a technical issue and so key policy experts, researchers and practitioners were carefully selected to give expert, unbiased opinions on the water governance of the upper Blue Nile river basin. For the quantitative data, the purposive sampling was limited to the groups of people interviewed. That is, a certain group of people with a special relationship (residents and adequate work experiences) with the upper Blue Nile river basin was selected. However, the question of participant selection was done none purposively.

The sample was large enough to capture disparities in socioeconomic conditions, political contexts, and water sector realities but small enough to allow it a rapid appraisal of significant water governance challenges and critical institutional responses. After carefully selecting the Amhara region as the sample region, some key institutions were selected for rigorous engagement. Since the sample covers different institutions such as Universities, Intergovernmental organisation, research institutes, basin authorities, NGOs departments under ministries, farmers unions and selected households, it can represent well the reality of the Ethiopian water sector in all its dimensions. The representativeness of the sample is further enhanced by its coverage of leaders and experts under this category of respondents. Only people with technical and or rich experience in the water sector were engaged. Although in some cases, households were engaged, the purpose was to gauge the perception of such people because such perceptions also matter.

3.6. Data collection instruments

The student could not find any published work on the water governance of the Blue Nile basin or the Nile for that matter. For the collection of the primary data, several approaches were reviewed. However, these different approaches have various methodological advantages and benefits. Expert polls have the advantage of providing well informed objective information but suffer from being based on the views of only a few individuals in the region. There are at least two challenges with this data collection methods. The first is that the ratings tend to reflect the political or ideological agenda of the organisation providing the ratings. The second is that a region with good economic outcome tends to receive an automatic high rating. On the other hand, the strengths of surveys are that they reflect the opinions of a significant number of respondents that are closely connected with the area that they are assessing.

On the other hand, they also have their merits surveys tend to be interpreted in context-specific ways, thus limiting the generalisation of results. Besides, they tend to be expensive and, as a result, typically cover a much smaller set of countries than the polls of experts. Based on these reasons, the adopted interviews for the water experts while relying on survey questions to gauge the perceptions of the other respondents.

3.6.1. **Interview guide**

Interviews have a purpose of gathering rich, in-depth personal experiences of people related to a particular research topic, (Magnusson and Marecek 2015). A semi-structured interview guide was designed for data collection. Nine predesigned open-ended questions were asked every informant. The categories of participants in the interview included the following: researchers, government officials, intergovernmental organisations, basin development experts and NGOs.

The interview questions are formulated in a way that will help to answer the research questions and tried to use a language that is comprehensible and relevant to the interviewees. The general kind of information like (Name) and specific kind of information like (Name of organisation or institution and position in the organisation) were asked as this information is useful for contextualising people's answers. Interviews are conducted once only, with an individual and generally cover not more than 30 minutes. The interviews were conducted in areas preferred by the respondents with high level of confidentiality.

An audio device was used to record the interviews upon the permission of the informants. The interviews were carefully transcribed before any analyses were done. To ensure originality and correctness, a maximum of two interviews were conducted in a single day. Also, recorded audios were transcribed before the next interview was conducted. This allowed the student to identify certain overlooked errors to correct them in the next session. It was also used to know when the data becomes saturated. Over, ten interviews were conducted all together. The interview data was used purposively to meet objectives one and three of the study.

3.6.2. **Survey questionnaire**

The database for the quantitative assessment of the indicators of water governance and its efficiency has been developed from both factual and perception information obtained by administering a predesigned questionnaire (see Appendix) to 40 water experts and users from the Amhara region. These experts, with considerable technical experience, have different disciplinary orientations and represent both governmental and nongovernmental views. As such, the sample represents various viewpoints on the nature and strength of water governance in the water sector. Besides, some of the perception-based survey information, anecdotal evidence and available secondary data are also used to validate some of the information gathered from the survey.

A total of 13 indicators (water governance function and principles) were carefully selected as a benchmark for measurement. Questions that measure these indicators were asked, and the responses were arranged on a Linkert scale of 5.



Figure -3 Questionnaire administration at the bank of the Abay River

3.6.3. Documents reviews

This consisted of a list of documents concerning topics crucially linked to the water governance of the Upper Blue Nile River basin in Ethiopia. In this case; textbooks, journals, magazines, thesis, conference papers, newspaper articles, government reports, internet, and dissertations related to the topic under investigation were reviewed. These documents were mainly accessed at the ENTRO and Addis Ababa University libraries.

3.7. Ethical considerations

A semi-structured interview guide was employed to ensure that participants were free to provide relevant data that is helpful for the study. The information gathered from the participants was kept confidential, and all audio files securely saved. No information reveals the respondent's identity. The findings of the study are generally for the study and have not reflected anything

particular of individual persons. Participation in this study was entirely voluntary. They had the right to declare to participate or not in this study. When they decided to participate, they had the right to withdraw from the study at any time, and this did not label them for any loss of benefits which they otherwise are entitled. The participants weren't forced to answer any question that they didn't want to answer. It must be noted that some participants willingly refused to be interviewed. In some cases, they suggested other participants they thought could provide in-depth information.

3.8. Key water governance Indicator

Thirteen key water governance indicators were selected purposefully for this study. They included a combination of water governance functions and governance principles. They included awareness, water allocation, capacity building, conflict management sustainability, regulating water resources uses, transparency, and access to justice, efficiency, participation, accountability, responsiveness, equitability and water ethics. These indicators have been used by numerous studies to measure the performance of water sectors in many cases (see, for example, Akhmouch & Correia, 2016; Berg, 2016; UNDP & Water Integrity Network, 2013). The indicators for measuring water governance are not constant, so the 13 were carefully selected based on the study area and how well they measure governance as well as how the student can appropriately measure each indicator.

3.9. Quality control and validity

A critical literature review and pilot study were conducted to assess the appropriateness of the questions. A translator was also employed to translate survey questions to most of the respondents carefully.

3.10. Data Analysis

3.10.1. Challenges of Water Governance in the Upper Blue Nile river basin

The data analysis for the challenges of water governance commenced with the careful transcription of the interview data. The audios were transcribed to word format before using Microsoft Excel to do a thematic analysis of the responses.

3.10.2. Calculating water governance efficiency

For this result, the survey questions were coded and then carefully inputted into the Statistical Package for Social Sciences (SPSS). The descriptive analysis was performed to find the mean age and mean responses for all indicators.

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	Numeric	8	2	Questionnaire_no	None	None	8	Right	Scale	Input
2	Town	String	8	0	Town of Respo...	{1, Bahir Da...	None	8	Left	Nominal	Input
3	Profession	String	8	0	Profession of R...	{1, Farmer}...	None	8	Left	Nominal	Input
4	Gender	String	8	0	Gender of resp...	{1, Male}...	None	8	Left	Nominal	Input
5	Age	Numeric	8	2	Age of Respon...	{1.00, 15 - 2...	None	8	Right	Ordinal	Input
6	Dependence	Numeric	8	2	Relationship wit...	{1.00, Dome...	None	8	Right	Nominal	Input
7	Satisfaction	Numeric	8	2	Overall satisfac...	{1.00, Very ...	None	8	Right	Ordinal	Input
8	Awareness	Numeric	8	2	I know the orga...	{1.00, Stron...	None	8	Right	Ordinal	Input
9	Water_Alloc...	Numeric	8	2	It is easy to get...	{1.00, Stron...	None	8	Right	Ordinal	Input
10	Capacity_b...	Numeric	8	2	There is buildin...	{1.00, Stron...	None	8	Right	Ordinal	Input
11	Conflict_mgt	Numeric	8	2	Mechanism an...	{1.00, Stron...	None	8	Right	Ordinal	Input
12	Sustainability	Numeric	8	2	Resources are ...	{1.00, Stron...	None	8	Right	Ordinal	Input
13	Regulating_...	Numeric	8	2	I have received ...	{1.00, Stron...	None	8	Right	Ordinal	Input
14	Transparency	Numeric	8	2	Information abo...	{1.00, Stron...	None	8	Right	Ordinal	Input
15	Access_to_...	Numeric	8	2	Access to griev...	{1.00, Stron...	None	8	Right	Ordinal	Input
16	Efficiency	Numeric	8	2	Impacts and re...	{1.00, Stron...	None	8	Right	Ordinal	Input
17	Participation	Numeric	8	2	Water users in ...	{1.00, Stron...	None	8	Right	Ordinal	Input
18	Accountability	Numeric	8	2	Decision-maker...	{1.00, Stron...	None	8	Right	Ordinal	Input
19	Responsive...	Numeric	8	2	Water governan...	{1.00, Stron...	None	8	Right	Ordinal	Input
20	Equity_and...	Numeric	8	2	Men and wom...	{1.00, Stron...	None	8	Right	Ordinal	Input
21	Total.functio...	Numeric	8	2	Total score for ...	None	None	13	Right	Scale	Input
22	Total.princip...	Numeric	8	2	Total score for ...	None	None	13	Right	Nominal	Input

Figure 3-4: Variable view of SPSS data entry

The dataset was exported for further analysis. Since the Linkert scale was used all responses had scores attached to them? For example, strongly agree translated to a score of 5; agree to 4; neutral to 3; disagree to 2 and strongly disagree translated to a score of 1. With this, the excel datasets showed the numeric view of all responses.

Table 3.1 Conversion of survey responses to numeric data based on a scale of 1 – 5

ID	Awareness	Water Allocation	Capacity building	Conflict management	Sustainability	Regulating water resources uses	Transparency	Access to justice	Efficiency	Participation	Accountability	Responsiveness	Equitability and water ethics
1	5	5	4	5	5	5	4	3	3	4	4	4	5
2	5	4	5	5	3	5	3	3	4	4	4	5	5
3	4	3	3	3	2	2	2	2	2	2	2	3	3
4	5	4	5	5	5	5	5	5	3	4	4	5	5
5	4	4	4	4	4	2	2	2	2	1	2	3	4
6	4	5	2	3	5	1	1	1	1	1	1	2	5
7	5	3	5	4	4	4	5	4	4	5	5	4	5
8	1	4	4	4	4	1	4	3	3	1	3	3	4
9	4	4	5	5	5	5	4	5	4	5	5	5	2
10	4	5	1	3	5	1	1	1	1	1	2	3	4
11	5	4	3	5	3	4	5	4	3	4	4	4	5
12	1	3	1	3	5	1	5	3	3	5	5	5	5
13	1	1	3	3	1	3	2	1	1	1	1	1	2
14	5	3	5	4	4	4	5	4	4	5	5	4	5
15	4	4	4	4	4	2	2	2	2	1	2	3	4
16	1	3	1	3	5	5	1	3	1	1	1	1	5
17	4	3	3	3	2	2	2	2	2	2	2	3	3
18	5	5	4	5	5	5	4	3	3	4	4	4	5
19	5	4	5	5	3	5	3	3	4	4	4	5	5
20	3	2	3	3	3	4	2	3	2	2	3	2	3
21	5	1	2	3	3	1	3	5	3	1	3	3	5
22	5	1	5	5	5	5	5	5	3	5	5	5	5
23	1	3	1	3	5	1	5	3	3	5	5	5	5
24	4	4	2	3	2	1	2	3	4	1	5	5	5
25	5	1	5	5	5	5	5	5	3	5	5	5	5
26	1	4	4	4	4	1	4	3	3	1	3	3	4

ID	Awareness	Water Allocation	Capacity building	Conflict management	Sustainability	Regulating water resources uses	Transparency	Access to justice	Efficiency	Participation	Accountability	Responsiveness	Equitability and water ethics
27	4	5	1	3	5	1	1	1	1	1	1	2	5
28	3	3	3	3	1	1	4	4	3	3	3	3	3
29	5	4	3	5	3	4	5	4	3	4	4	4	5
30	1	3	1	3	5	5	1	3	1	1	1	1	5
31	6	4	5	5	5	4	5	5	5	5	5	5	5
32	5	3	3	3	1	1	2	3	4	2	5	4	2
33	5	4	5	4	4	5	5	4	5	5	4	5	5
34	3	2	4	4	5	2	3	4	4	4	5	5	4
35	4	2	4	3	2	2	2	2	2	2	4	2	2
36	5	4	4	3	3	4	5	4	4	4	3	3	2
37	4	4	2	4	4	2	2	2	2	2	4	2	2
38	3	3	3	3	1	1	4	4	3	3	3	3	3
39	5	5	4	3	3	3	5	4	2	3	2	4	4
40	5	5	4	2	2	3	3	3	3	3	3	2	5

The water governance efficiency was then calculated with the following steps:

Finding the mean response

$$\bar{x} = \frac{\sum x}{n}$$

Where:

\bar{x} = sample mean

$\sum x$ = sum of all data values

n = number of data items in the sample (responses)

This implies that

$$\bar{x} = \frac{\sum x}{n} = \bar{x} = \frac{136.6}{40} = \underline{\underline{3.415}}$$

Finding the coefficient of 3.415

$$\frac{3.415}{5} = \underline{\mathbf{0.68}} \quad (5 \text{ because we have a 5 level Linkert scale})$$

$$0.68 = \underline{\mathbf{68\%}}$$

3.10.3. **Improving institutional capacity on the Upper Blue Nile River basin**

Thematic analysis was used to analyse the raw data to come out with the results for this objective. The interview recordings were carefully transcribed into a word document before using Microsoft excel to do the thematic analysis.

3.11. **Chapter summary**

In this chapter, the study was situated in the Blue Nile river of Ethiopia, specifically the Lake Tana region of Ethiopia. It describes the study area in detail, including the political, economic and social importance of the Upper Blue Nile River Basin. It also introduces the water governance structure of the Upper Blue Nile river basin, sources of data, sample and sampling techniques, as well as data collection instruments. Also, the chapter is the backbone of the study as it gives a step by step description of the methods used to achieve all the objectives of the study. More importantly, the methods use has met all quality controls and the ethics of research in Ethiopia.

CHAPTER FOUR

4. RESULTS

4.1. Introduction

This is a presentation of the empirical findings of the data from the analysis carried out without any interpretation. The results are presented in the same order as the research questions. It first starts by giving a brief sectorial breakdown of the key respondents to the interview respondents before presenting the results of the interview analysis. The second section presents the results for the quantitative analysis. A brief descriptive statistic (such as the mean age and gender of respondents) of the data set is presented before the results of the water governance efficiency is displayed. Cronbach Alfa is also used to prove the consistency and reliability of the data set.

4.2. Respondents information

4.2.1. Survey demography

Table 4.1: Gender distribution of respondents

		Frequency	Percent
Valid	Male	30	75.0
	Female	10	25.0
	Total	40	100.0

Table 4.2: Age distribution of the sample

		Frequency	Percent
Valid	15 – 24	10	25.0
	25 – 44	24	60.0
	45 – 64	6	15.0

4.2.2. Interviewee profile

The interviews involved ten key informants in the water governance sector of Ethiopia as well as researchers and students. The z Zig-zag approach was employed until d the sample reached d saturation point. The next table gives a brief overview of the backgrounds of the informants.

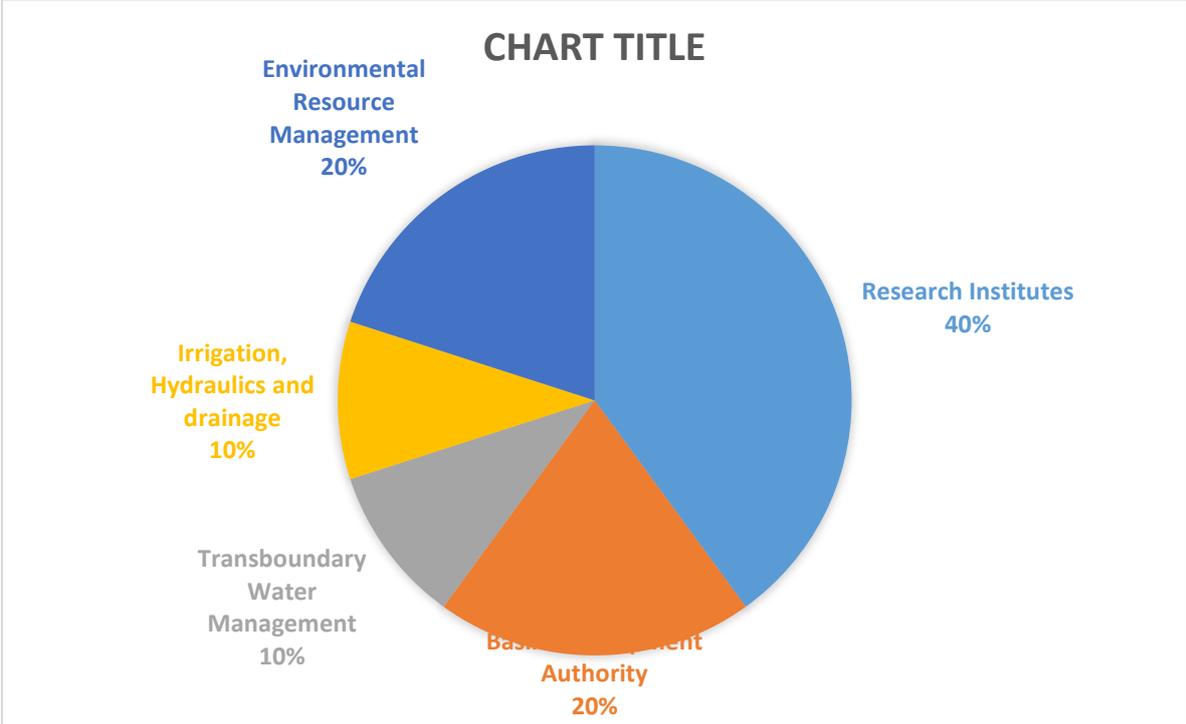


Figure 4-1: Sectorial breakdown of key informants in the study

4.3. Challenges of Water Governance

The findings of the interviews conducted to identify the challenges of water governance in the upper Blue Nile River received the following responses.

- There are inadequate institutional setups to govern the Upper Blue Nile River basin. In areas where these institutions are established they are weak.
- There is also increasing competing interests among different users of the resources of the Blue Nile. This competition also exists among the Nile Riparian countries especially Ethiopia and Sudan.
- There is also a lack of adequate hydrological data on the quantity and qualities of the upper Blue Nile. This makes it difficult to understand the challenges and the solutions needed to govern the Upper Blue Nile River Basin.
- There is also a lack of cooperation among watershed managers and local people who rely on the Upper Blue Nile for their livelihood.

The core themes expressed by the respondents are expressed in the table below.

Table 4.3: Challenges of Water Governance

Themes Identified	Frequency	Proportion
Institutional Challenges	8	47%
Competing interests	4	24%
Inadequate Hydrological data	3	18%
Lack of cooperation from locals	2	12%
Total	17	100%

Note: The frequency indicates the number of challenges identified by the respondents.

4.4. Social Factors influencing water governance in the Upper Blue Nile Basin

Several social factors were seen as obstacles to the proper water governance of the upper Blue Nile. More than half of the respondents identified behavioural challenges as the main challenge been faced by watershed managers. Increasing population density along the Upper Blue Nile was also a key factor. Poor institutional setups also contributed a great deal to the challenges of proper water governance.

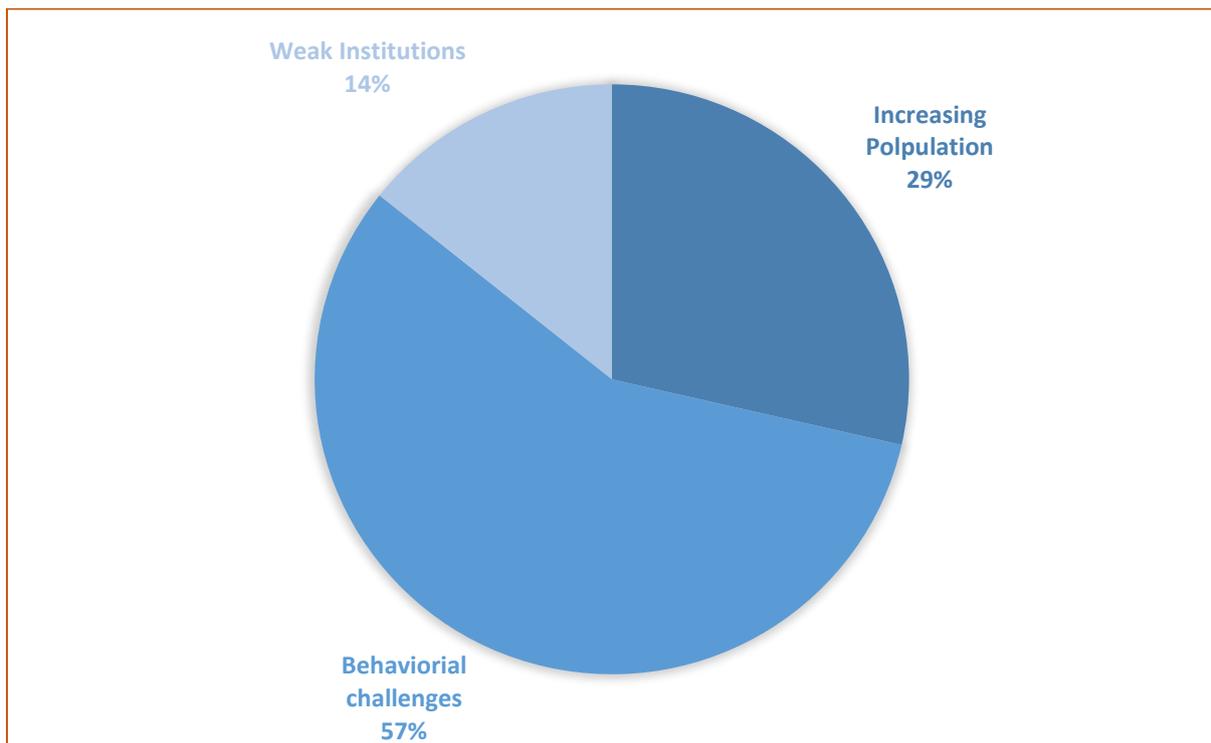


Figure 4-2: Social Factors the Upper Blue Nile River Basin

4.5. Environmental factors that affect water governance

The following responses were identified.

- The most significant environmental challenge to water governance in the Upper Blue Nile is Erosion and Land degradation.
- The topography and spatial difference in the climate of the Upper Blue Nile makes it so hard to govern because different regions require different water management approaches.
- Predatory aquatic plants are also invading the upper Blue Nile, and this makes governance difficult. For example, the Water hyacinth plant has continuously invaded the lake Tana killing aquatic life in it and making it unnavigable.
- Also, pollutants from industry, agricultural land and other pollutants affects water governance especially in domestic water supply systems.

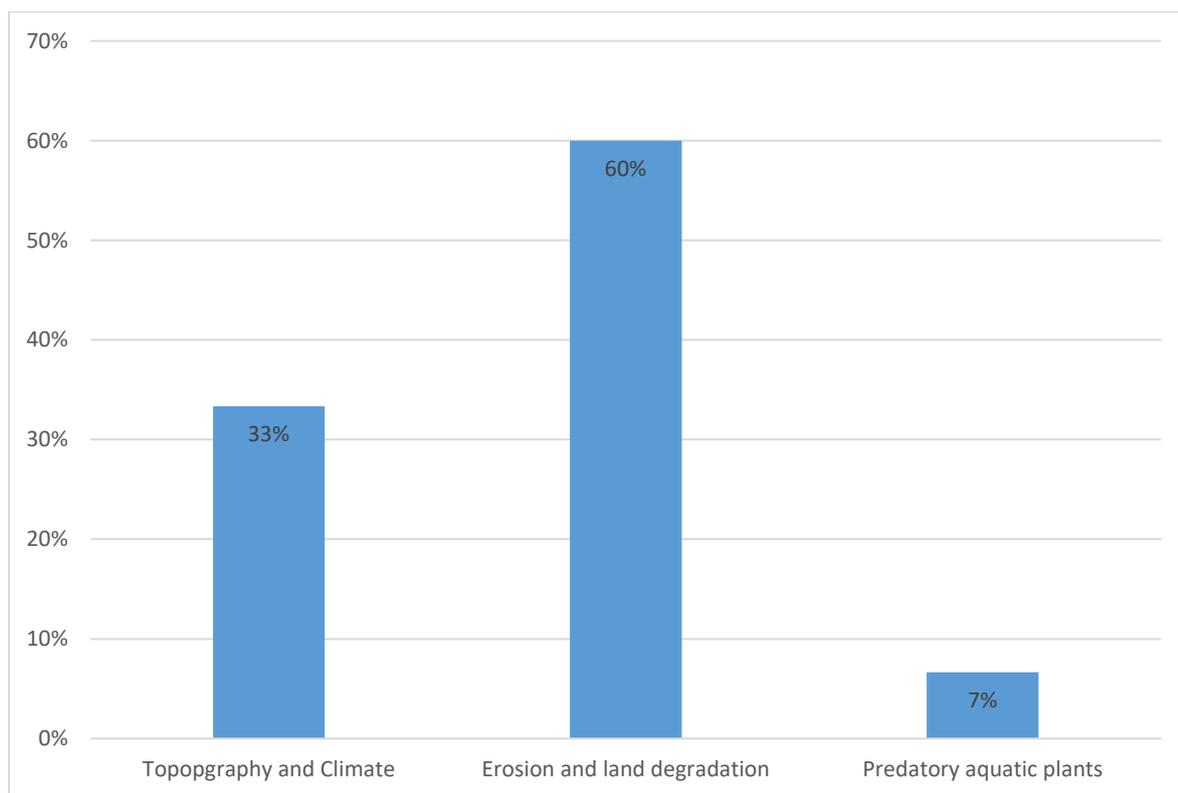


Figure 4-3: Environmental challenges in water governance of the Upper Blue Nile

4.6. Political dynamics that affect water governance

The study also revealed some political factors that hampered proper water governance in the river basin. Majority of the respondents agreed that the lack of political commitment often affected proper water governance in the Upper Blue Nile river basin. Regionalism in Ethiopia and political instability in areas around the Blue Nile has also hampered the proper governance of the Upper Blue Nile. The study also showed that over the years, there has been a misalignment between the hydrological boundaries of the Nile and the political boundaries in the region.

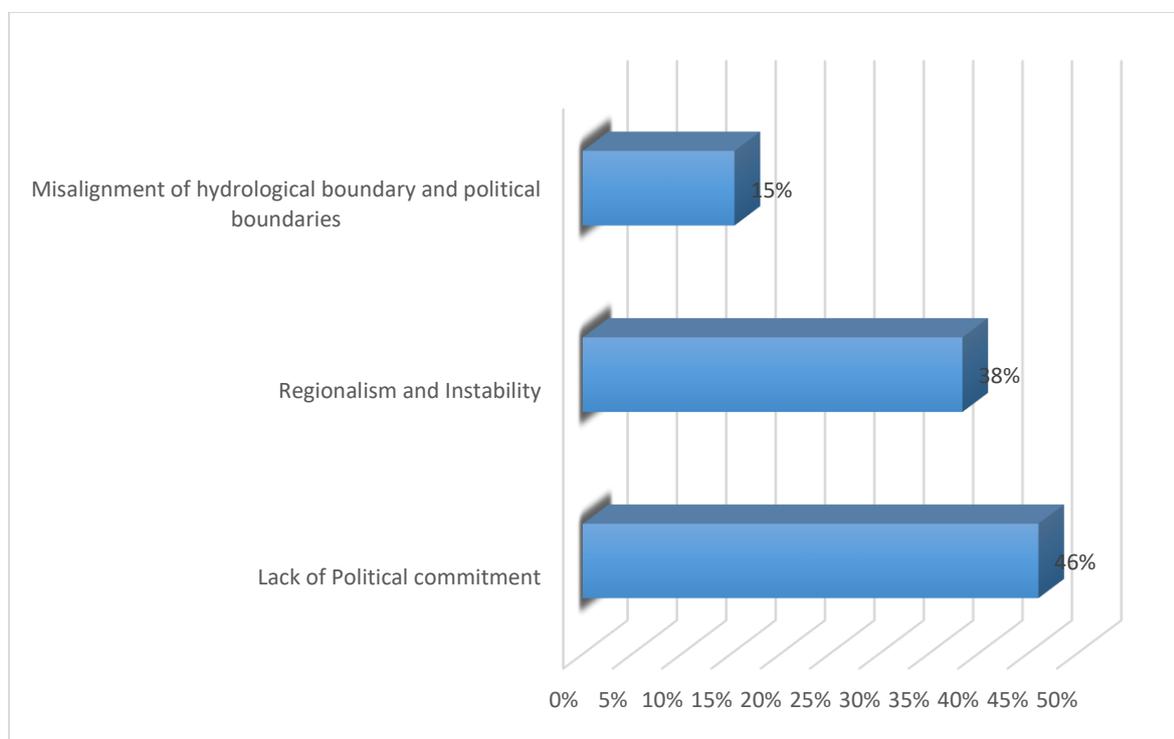


Figure 4-4: Political dynamics on the Upper Blue Nile River Basin

4.7. Core benefits and opportunities identified

Despite the plethora of challenges associated with the water governance of the Upper Blue Nile river basin, several opportunities for development and adequate management were identified in the study. These opportunities, if adequately exploited will not only save water but will also drastically find solutions to the challenges identified.

4.7.1. Economic benefits of the Upper Blue Nile River Basin

On the question of economic benefits, the results showed that the Blue Nile was the hub of economic activity in the region.

- Some respondents stated that the upper Blue Nile is the primary source of employment for farmers, fishers, businesspeople and many people in the Amhara region.
- It was also found out that the Upper Blue Nile is a vital source of Hydropower in the whole of Ethiopia. The grand renaissance dam project is being built on the Upper Blue Nile.
- In addition, The Upper Blue Nile especially Lake Tana is also a major tourist centre in Ethiopia and beyond.

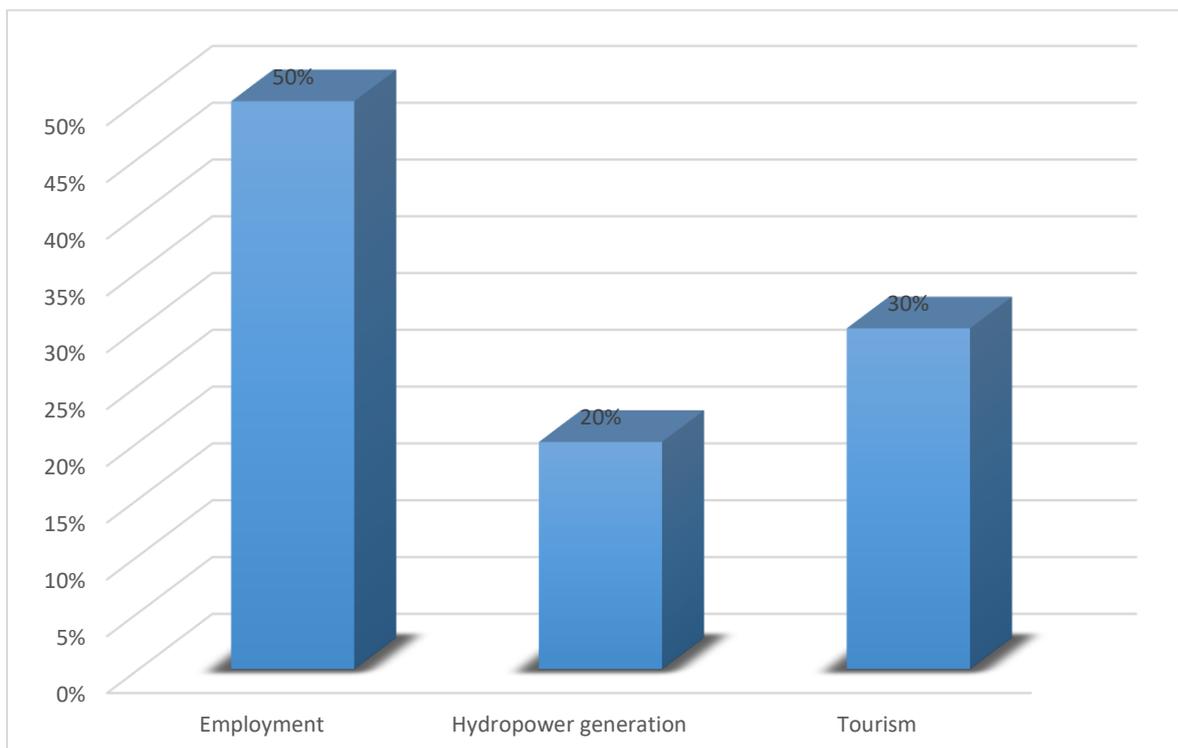


Figure 4-5: Core economic benefits of the Upper Blue Nile River Basin

4.7.2. **Improving communication and cooperation on the river basin**

Improving communication is the second opportunity of water governance on the Upper Blue Nile and the entire Nile as a whole. On how this can be done, the following recommendations were made.

- There should be improved management practices both at the regional level and federal levels and among riparian countries especially Ethiopia and Sudan.
- Benefits sharing of the Upper Blue Nile should be based and backed by science.
- There should be political will to protect the water resources of the Upper Blue Nile.
- Cooperation among institutions and countries should start at the lowest level possible and allowed to grow into bigger cooperation.

4.8. Water Governance Efficiency

Table 4.4: Percent distribution of responses on a Linkert scale of 1 to 5

Indicators	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Awareness	45%	28%	10%	0%	18%	100%
Water Allocation	18%	38%	28%	8%	10%	100%
Capacity building	25%	28%	23%	10%	15%	100%
Conflict management	28%	23%	48%	3%	0%	100%
Sustainability	38%	20%	20%	13%	10%	100%
Regulating water resources uses	28%	18%	8%	18%	30%	100%
Transparency	33%	18%	13%	25%	13%	100%
Access to justice	15%	25%	35%	15%	10%	100%
Efficiency	5%	23%	38%	20%	15%	100%
Participation	23%	23%	10%	15%	30%	100%
Accountability	28%	25%	20%	15%	13%	100%
Responsiveness	30%	20%	28%	15%	8%	100%
Equitability and water ethics	55%	18%	13%	15%	0%	100%

From Table 3-1,

Total mean = 44

Coef. = 8.86

Overall mean = 0.681538

Efficiency = 68%

Where:

Total mean = the sum of all the numerical values of the responses divided by the total number of responses,

Coefficient = the total mean over 5 since a 5 level Linkert scale is used.

4.9. Improving Institutional capacity on the river basin

The upper Blue Nile River basin is plagued with institutional challenges that makes water governance inadequate. This can be seen in the efficiency calculation based on perceptions data. There, is therefore the need to improve institutional capacity on the river basin. On how this can be done, the following themes were collected.

Table 4.5: Improving Institutional capacity on the Upper Blue Nile River basin

Main Findings	Frequency	Proportion
Political Commitment	3	20%
Innovation	3	20%
Watershed based management	2	13%
Capacity building	2	13%
IWRM	1	7%
Coordinated decision making	4	27%
Total	15	100%

Note: Frequency is the number of responses to the question “how can institutional capacity on the Upper Blue Nile River Basin be improved?”

4.10. Reliability of findings

4.10.1. Internal consistency

Reliability is related to the degree to which a research instrument produces consistent results (Heale & Twycross, 2015). For the survey questionnaire, Cronbach Alfa was used to test internal consistency.

Table 4.6: Reliability test results from SPSS

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.879	0.882	13

From the table, the Cronbach Alpha coefficient is estimated at 0.879, meaning that about 88% of the variants in the composite score of the 13 indicators are true variants or internally consistent variants.

4.10.2. Participant error

To reduce the occurrence of participant error to the barest minimum, most of the respondents of this study were interviewed or engaged immediately after lunch hours (between 13hrs – 14hrs). This was to ensure that respondents were refreshed and were in a good mood to give honest responses. Some respondents were also engaged in their homes, offices or along the banks of the Upper Blue Nile where they felt comfortable.

4.10.3. Participant Bias

Several efforts were made to ensure participants were not biased in their responses. Participants were engaged in quiet private places where they were free from intimidation or fear from others. They were also assured of the anonymity of the whole process. In some cases, the student did

not even ask the participants their names. Therefore, the student is confident that the responses were unbiased.

4.10.4. Researcher Error

To avoid this, the student employed the zig zag approach. Therefore, at maximum, only two interviews were conducted in a day. This was to give the student time to carefully transcribe and interpret all results without error before conducting the next interview.

4.10.5. Researcher Bias

This was eliminated totally from the work from the very beginning of the study. To produce an unbiased work, the student chose not to work with a hypothesis to reduce the tendency of having to interpret the data in a biased way. The study was an exploratory study, so all findings were presented as they were found.

4.11. Validity of findings

4.11.1. Construct validity

The student is confident that his works accurately measures the Water Governance efficiency of the Upper Blue Nile River Basin. To achieve construct validity, the student chose to do an exploratory study since no studies have ever attempted to measure the water governance efficiency of the Upper Blue Nile. Exploratory studies require an inductive research approach, which in turn uses quantitative methods. Since it is usually not clear who is best placed to provide insights as to the quality of governance in a particular country, the student chose to gather the perceptions of water users on water governance functions and principles. A Survey questionnaire was designed to allow participants to rate water governance functions and principles.

4.11.2. **Internal validity**

There is a causal relationship between all the thirteen indicators and water governance. For this study water governance is the dependent variable while the thirteen indicators (awareness, water allocation, capacity building, conflict management, sustainability, regulating water resources uses, transparency, access to justice, efficiency, participation, accountability, responsiveness, equitability and water ethics) are the independent variables. These variables are a combination of functions related to water governance and universal governance principles which accurately measure water governance.

4.11.3. **External validity**

The findings of this study meet the external validity criteria because the findings can be generalised to other settings or groups. A very representative sample was selected during the data collection to achieve that. Representatives or leaders of the participant's categories were selected to ensure proper representation of the population.

4.11.4. **Chapter summary**

Chapter four presents the key findings of the research. The findings are presented in the same order as the research questions. The findings showed that the water governance efficiency of the Upper Blue Nile river basin is at 68 per cent. Besides that, the reliability and validity of the findings are justified.

CHAPTER FIVE

5. ANALYSIS AND DISCUSSION

5.1. Introduction

This chapter compares, discusses and interprets the results of the research that focuses on presenting and describing both qualitative and quantitative findings. Accordingly, it highlights the significant parts of the findings of the research. This is necessitated by the need to find answers to the research questions that form the basis of this study. The key findings are presented and how they fit into the general body of literature in Water Governance is discussed.

5.2. Challenges of Water Governance in the upper Blue Nile river basin

Close to half of the participants identified weak and inadequate institutional capacity and structure as the main challenge to have better water governance in the river basin. This supports the findings of other researches that have explored the challenges of water governance in Ethiopia. For example, a report released by the Overseas Development Institute (ODI) identified significant gaps in the institutional framework of Ethiopia's water sector as the fundamental challenge of water management and development. Unlike the Awash basin that is surrounded by relatively big and industrialised towns, the Abay is rural, less developed, hydro politically complex and so that has not received the utmost attention from the federal, regional and local governments and all concerned stakeholders.

Moreover, the significant development on the basin has been small scale irrigation schemes usually less than 200ha that are managed by local users. This confirms a view advanced by Kansal M. et al. (2014) that even though Ethiopia has a decentralised political and administrative system, water projects in urban areas are not decentralised and are directly within the jurisdiction of the central government whiles locals manage agricultural water resources. The development and effectiveness of institutions at the local level usually takes a long time, because of lack of supervision from the government side and technical incompetence of local administrators.

In the environmental perspective, the study showed that erosion and sedimentation was the primary water governance challenge in the Upper Blue Nile River basin. Some respondents believed sedimentation was a natural phenomenon due to the very nature of the Ethiopia highlands. For example, respondent #8 states that. “the very nature of the Ethiopian highlands causes a lot of land degradation and sedimentation”. On the other hand, some respondents attributed it to human made causes. For example, respondent #10 shared that “there is huge disafforestation, there is more cultivation of sloppy areas and this coupled with the absence of conservation and the intensive rainfall results in degradation of the Ethiopian highlands”. However, irrespective of whether this challenge is human made or not, the problem of sedimentation is on the rise. For example, Gebremicael et al. (2013) using the Mann–Kendall and Pettitt tests to measure trends of sediment load, found out that there has been a significant increase in sediment load at the outlet of the Upper Blue Nile basin at El Diem station from 1980 to 2009. This conclusion was made at a 5% confident level. Several other studies have been conducted using modelling to estimate soil loss and also to identify soil and water management interventions that reduce soil erosion (see Dile et al., 2018; Garzanti, Andò, Vezzoli, Ali Abdel Megid, & El Kammar, 2006; Gebrehiwot, Bewket, Gärdenäs, & Bishop, 2014). The problem is that these studies have focused primarily on the geochemical aspects of sedimentation, thereby neglecting simple anthropogenic solutions to this problem.

5.3. Water governance efficiency

The water governance efficiency was estimated with 13 carefully selected indicators. These indicators were selected from generally accepted water governance theories, functions and principles. The study revealed some fascinating findings. For example, 45% per cent of the respondents strongly agreed that they were aware of water governance institutions and structures on the Upper Blue Nile. This finding was not surprising because local land and water institutions have always played a crucial role in the management of the Blue Nile in Ethiopia. Integrated watershed management in Ethiopia started about three decades ago, even though agricultural activities have revolved around the Upper Blue Nile for over three thousand years. Besides, more than half of the respondents strongly agreed that both men and women had equal access to water resources of the Upper Blue Nile River. This is because women dominate the agricultural sector in Ethiopia. According to a report by USAID (2018), 80 per cent of the Ethiopian population lives in rural areas, and women form the majority of the agricultural

labour force in these areas. However, this indicator did not delve into the ownership of water resources. Several studies have suggested that even though women dominate agricultural labour in Ethiopia, the effort are often unrecognised, and they are not fully engaged in decision-making practices (Demie, Bekele, & Seyoum, 2016; USAID, 2018).

Another interesting finding was on the question of water conflict management. Forty-eight per cent of the respondents in the survey questionnaire were neutral on the question of if there were significant water conflict management mechanisms. There are two possible explanations for this: firstly, people did not know for one reason or another. The second is that there was no water conflict among local users on the Upper Blue Nile and so conflict resolution mechanisms have not been activated for users to see. This view was expressed by respondent # 3 on the survey questionnaire.

We have been using the Abay since I can remember. We the flower farmers, fishermen, car wash owners and vegetable farmers have worked peacefully here for years because we all have different areas, we work in. I cannot say if there are conflict resolution mechanisms on the Abay, but what I know is that we have not had confrontations that have involved close attention and arbitration.

Overall the study showed the water governance efficiency of the Upper Blue Nile River Basin to be estimated at 68 per cent. It is difficult to explain what this percentage implies because as far as the student is concerned, this is the first study that explored the water governance efficiency of the Upper Blue Nile river basin. However, 68 per cent is a good rating when considering the quality of governance in Ethiopia in general. For example, according to the World Governance Indicators, governance effectiveness in Ethiopia is -0.70 out of a scale of -2.5 – 2.5 (where -2.5 is very poor, and 2.5 is very strong) (Kaufmann & Kraay, 2018). Also, on regulatory quality of governance, the score is -1.01 on the same scale (Kaufmann & Kraay, 2018). Also, Transparency International ranks 180 countries and territories by their perceived level of public sector corruption. On this score, Ethiopia scores 34/100 and is ranked 114 out of a total of 180 countries (Transparency International, 2018). Perhaps the closest to water governance is the Water Poverty Index where Ethiopia as at the year 2002 was bottom with a score of 33 (Lawrence, Meigh, & Sullivan, 2002).

Therefore, from the broader governance context, 68 per cent efficiency on water governance is a good mark. This is not unprecedented because of some sectors, especially the water sector; sometimes perform even in the bad political landscape. For example, an objective evaluation

of the Phnom Penh Water Supply Authority of Cambodia by Biswas (2010) revealed that the performance indicators of the water supply system are better than those of London, Paris and Los Angeles. Yet Cambodia's ranking in terms of the Corruption Perception Index (CPI) for overall governance is abysmal. It ranks 158 in the CPI, along with countries like the Central African Republic, Laos and Tajikistan, and is lower even than Zimbabwe which is ranked at 146. Thus, the governance indicators at the national level may give some general indication of the type of water governance in the rural level, but in many cases, these indicators may prove to be completely erroneous. Therefore, the 68 per cent water governance efficiency of the upper Blue Nile river basin is justified.

5.4. Improving Institutional Capacity on the river basin

Improving the water governance of any water use sector is hampered by the unavailability of sound, objective, unbiased and independent analyses of excellent and replicable case studies. In the absence of analytical, comprehensive and usable studies of good water governance, learning from the advances made by other countries and applying that knowledge has been very limited. For example, at present, the water profession is not even aware of which cities and irrigation-related institutions have made remarkable progress in improving governance during the past decade. Nor is it known what were the main factors of the enabling environment that allowed these institutions to improve their water governance significantly within a period of a decade or so (Biswas & Tortajada, 2010)

Institutions specify the 'rules of the game' that control how water is governed. It is crucial to understand how institutions work because they define how a public sector is organized, the policies and laws that are in place, and how they are implemented (UNDP & Water Integrity Network, 2013). Institutional challenges dominate studies on the challenges of water governance in the Upper Blue Nile basin and water governance in Ethiopia in general. Therefore, the study also sought to identify how to improve institutional capacity for proper water governance of the Upper Blue Nile basin.

From the findings, 27 per cent of the participants pointed out that improving institutional capacity on the Upper Blue Nile will require coordinated decision making. For example, Respondent #3 lamented that all the institutions necessary for proper water governance on the Upper Blue Nile existed, but there is a lack of coordination among them. The solution suggested

was that "sectors from both government and private sector must collaborate in managing water resources. Communities must work hand in hand with the government". Respondent #9, a basin development official, confirmed this in his statement that *"efforts are currently in place to ensure institutions can collaborate in their management efforts. We have the ministry of water irrigation and energy, ministry of agriculture, ministry of livestock, ministry of environment and climate change. These are the four ministries that are focusing on watershed management or environmental management. There are also NGOs that are working on watershed management. So, we have started to work together by bringing the finances together. We have planned to do at least one common area, that is, to protect the areas around the renaissance dam"*. The significance of coordinated decision making in building institutional capacity for water governance have been emphasized in several studies (see, for example, Hilhorst, 2008; UNDP & Water Integrity Network, 2013; Woodhouse & Muller, 2017). Coordination among institutions has the potential to increase the capacity of personnel and institutions through information sharing, sharing of technology and complementing of functions.

5.4.1. **Data collection**

The very process of measuring governance is plagued with a plethora of challenges. For example, who is best placed to give insight into the quality of governance and water governance for that matter, is still a hotly debated issue. Water experts are undoubtedly equipped with the skills and knowledge needed to assess the performance of water managing structures technically. Yet if the purpose of water governance is to develop and manage water resources in such a manner that ensures the delivery of water services, at different levels of society (GWP, 2002), then the public cannot be exempted from forming their perceptions of the quality of governance.

Moreover, since the purpose of this work was to improving water governance on the Upper Blue Nile river basin, the student centred the study on the public. Based on this, both qualitative and quantitative data collection techniques were used in the study. For measuring the water governance efficiency of the Upper Blue Nile, a purely quantitative technique was used: the student used a survey questionnaire to gauge the perceptions of the public on governance satisfaction. This methodology is in line with other studies that seek to measure governance. For example, the Afrobarometre, Latinobarometro and Transparency international all use

surveys to assess and rate various aspects of governance (Afrobarometre, 2018; Latinobarometro, 2018; Transparency International, 2018)

For further authenticity, the student was careful to use only well-grounded perceptions, that is, only well-informed respondents who represented a water user group were engaged. This is because the perceptions of such persons will be closer to the realities on the ground. Also, as representatives, their views closely mirror the views of the user group they represent. This methodology has been agreed to be the best way to measure perception data. The World Governance indicators, for example, uses survey questions, but the target group is usually experts who can give objective views on the quality of governance (Court, Hyden, & Mease, 2002).

Overall the adoption of the survey questionnaire is undoubtedly one of the best and more practised techniques for assessing governance irrespective of the sector.

5.5. Chapter summary

This chapter presented the data analysis and discussion of the study. The findings of the challenges of water governance in the paper Blue Nile river basin supported previous literature in the area. The emergence of institutional challenges as the main problem on the Upper Blue Nile river basin coincided with reports such as the one from the Overseas Development Institute. The second section of this chapter discussed the water governance efficiency score and how it relates to other assessments of governance. It was concluded that 68 per cent was a good score considering the rating of Ethiopia in world governance and development rankings. Strategies for improving water governance was also discussed. The chapter concludes with a discussion of the data collection techniques adopted for the study.

CHAPTER SIX

6. CONCLUSION AND RECOMMENDATION

6.1. Introduction

This chapter offers a concise overview of the study on measuring the water governance efficiency of the upper Blue Nile River basin of Ethiopia. The first part of this chapter highlights the purpose and objectives of the study as well as the methodological approach to meeting these objectives. The second part highlights the key findings of the study and how it fits into the broader water governance literature. The last part of then suggests some few recommendations for water governance and future research.

6.2. Purpose of the study

Generally, the purpose of this study is to measure the water governance efficiency of the upper Blue Nile river basin to help in the sustainable management of the river basin development and governance systems. The study data collection was conducted in Ethiopia, specifically in the Lake Tana sub-catchment, the primary water sources of Blue Nile River basin located in Bahir Dar area of the Amhara region. Lake Tana sub-catchment is the headwater of Abay (Blue Nile) River contributing a significant amount of fresh water to the basin.

Currently, the whole shoreline of the Lake Tana in Arbayitu Kebele is invaded by water hyacinth. The lake is very shallow and filled by sediments, in the shallow waters; water hyacinths are rooting themselves into sediment and fully rooted on the shorelines. Besides, it is difficult to see open water in the affected area of the la. As a result, aquatic fauna like e fish, hippopotamus and the like are not found there.

The first and foremost objective of the study was to identify the challenges of water governance on the Upper Blue Nile river basin. This was done by reviewing documents and engaging key stakeholders in the basin in interview sessions. The second objective was to determine the efficiency of water governance in the basin. This was achieved by administering a survey questionnaire to a sample of the water user population in the area. The final objective was to suggest ways to improve institutional capacity for proper water governance on the basin.

6.3. Findings of the study

The study identified that weak and inadequate institutional capacity and structure of the water sector as the main challenge to have better water governance in the river basin. This conclusion was supported by close to half of the participants of the research. Other challenges included high erosion and sedimentation problems in the river basin exacerbated by anthropogenic factors such as the steepness of the Ethiopian highlands and inadequate political commitment on the part of the state.

On the question of the efficiency of water governance, the score was at 68 per cent, which seems an encouraging mark in the context of Ethiopia. Compared with other indicators such as Transparency International and the World Governance Indicators, 68 per cent of water governance efficiency score is good progress made.

The last finding is how to improve institutional capacity on the river basin. Despite the numerous challenges and political instability faced by water governing institutions in the basin, there is still tremendous opportunity for improvement. On how to improve institutional capacity, the findings identified that making conscious efforts to create coordination among institutions will increase institutional capacity. This is because coordination leads to sharing of information, conduct continuous transformational information management system, capacity building, transfer of knowledge and technology and even sometimes the transfer of personnel. When this is done, low capacity institutions like basin commissions can benefit immensely from the interaction with well-advanced institutions.

6.4. Recommendations

Many professionals and politicians mainly worry about the water quality and quantity of the Nile river basin. However, it is equally vital to improving the water governance efficiency of the basin. Because if we cannot measure governance, we cannot improve the system. Sixty-eight per cent efficiency is a good mark, but we do recommend several avenues for further improvement and to keep the sustainability of the basin freshwater resources. The way forward for water governance in the Upper Blue Nile will be to note that:

Sustainability on the Upper Blue Nile river basin will require cooperation and appropriate networking among all the Nile riparian countries. For this to be achieved, the capability of each state must be enhanced through coordinated capacity buildings and activities. Cooperation will

create opportunities for saving and maximising water resources. For example, through communication and cooperation projects such as dams can be constructed in Ethiopia where there is less evaporation and the electricity exported to Sudan and Egypt. This will also ring a comparative advantage.

Also, an environment must be created that highlights the importance of shared experiences among professionals and decision-makers.

There should be efforts to conserve water in the upper Blue Nile. When all parties are sure of the sustainable availability of water, cooperation becomes more natural.

Downstream countries should support water and soil conservation efforts in upstream countries like Ethiopia in the form of technical assistance and even financial commitment. This is because what happens in the upstream countries will affect streamflow in the downstream countries.

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APPENDICES

Appendix A: Survey Questions on Water Governance of the Upper Blue Nile River Basin

Survey Questionnaire on Water Governance of the Upper Blue Nile River Basin

My name is Mr Fletcher Kwabena. I am a student at the Pan African University Institute of Water and Energy Sciences (**PAUWEs**), Algeria conducting a research on measuring the water governance of the Upper Blue Nile River basin. I would like to hear from you about your engagement on the water resources on the Nile and your view on how they are managed. The survey should only take 5 minutes and your responses will remain anonymous.

If you have any questions about the survey you can contact the following people:

Researcher:

Mr Fletcher Kwabena of the Pan African University on +251 9918 772 59.

Advisors:

Dr Azage Gebreyohannes, main advisor from the Ethiopia Institute of Water resources, Addis Ababa University on +251 934 401032.

Dr Eric Tambo, research coordinator at PAUWEs on +213 5553 8966.

Respondent's Information

Region: _____ Town: _____ Respondent's Profession/position:

What is your gender?

Male

Female

What is your age?

15 – 24

25- 44

45- 64

60+

Which of the following best describes you?

I rely on the upper Blue Nile for,

Domestic water supply

Irrigation water

Hydropower

Industry

Two or more of the above

Overall, how satisfied are you with the water use service in question III?

Very satisfied

Somewhat satisfied

Neither satisfied nor dissatisfied

Somewhat dissatisfied

Very dissatisfied

Water Governance Functions

Please select your level of agreement. Where strongly agree is rated highest (5) and strongly disagree the lowest (1).

Indicators	Governance Functions Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		(5 pts)	(4 pts)	(3 pts)	(2 pts)	(1 pt.)
Awareness (1)	I know the organization responsible for governing the Upper Blue Nile River basin	<input type="radio"/>				
Water Allocation	It is easy to get water permits and licenses	<input type="radio"/>				
Capacity Building (3)	There is building awareness of water issues and priorities as well as coordinated decision-making	<input type="radio"/>				
Conflict management (4)	Mechanism and practices of addressing water conflicts that face stakeholders in the basin exist	<input type="radio"/>				
Sustainability (5)	Resources are used and conserved to ensure availability for future use.	<input type="radio"/>				
Regulating water resources uses (6)	I have received training on protecting the ecosystem	<input type="radio"/>				

Water Governance principles

Please select your level of agreement. Where strongly agree is rated highest and strongly disagree the lowest.

Indicators	Governance Principles Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
		(5 pts)	(4 pts)	(3 pts)	(2 pts)	(1 pt.)
Transparency (7)	Information about decisions on water governance are made known to the public.	<input type="radio"/>				
Access to justice (8)	Access to grievance and to seek redress exists for stakeholders (modern or traditional).	<input type="radio"/>				
Efficiency (9)	Impacts and results of decisions and projects can be measured to ensure value for money and resources.	<input type="radio"/>				
Participation (10)	Water users in the basin are directly involved in the development, planning and decision-making process that affects their water use right.	<input type="radio"/>				
Accountability (11)	Decision-makers and water professionals in the basin are accountable to the public and stakeholders for maladministration.	<input type="radio"/>				
Responsive-ness (12)	Water governance decisions and programs are responsive to the needs of water users.	<input type="radio"/>				
Equitability & water ethics	Men and women have equal access to water resources while efforts are made to bridge past inequalities.	<input type="radio"/>				

Thank you for taking your time!

Data Collected by: _____ **Signature:** _____ **Date**

Appendix B: Interview Guide

Interview Guide

My name is Mr Fletcher Kwabena. I am a student at the Pan African University Institute of Water and Energy Sciences (**Pauwes**), Algeria conducting a research on **measuring the water governance of the Upper Blue Nile River** basin. I would like to hear from you about your engagement on the water resources on the Nile and your view on how they are managed. The interview a few minutes and your responses will remain anonymous.

If you have any questions about the interview you can contact the following people:

Researcher:

Mr Fletcher Kwabena of the Pan African University on +251 9918 772 59.

Advisors:

Dr Azage Gebreyohannes, main advisor from the Ethiopia Institute of Water resources, Addis Ababa University on +251 934 401032.

Respondents Information

Region: _____ Town: _____ Profession/position: _____

Institution name: _____ Sex: Male, Female

Interview questions

What do you think are the **challenges** of water governance in the upper Blue Nile river basin?

Please tell me about the **economic benefits** of the Upper Blue Nile river basin.

What are the **social factors** that affect the governance of the river basin?

In your opinion what are the **environmental factors** that affect the governance of the river basin?

What are some of the **political dynamics** in the governance of the river basin?

What do you think should be done to improve **cooperation and communication** among **institutions** and riparian countries in the governance of the upper Blue Nile river basin?

What is the way forward in the Upper Blue Nile river basin?

To **improve political commitment** on the river basin

Increase institutional capacity on the river basin

To **build confidence** among riparian countries

to bring/strengthen **Integrated River Basin Development and Management (IRBM)**.

Thank you for taking your time!

Appendix C: Challenges of water governance (thematic analysis)

No.	Responses	Themes	Poor/weak Institutions	Competing interests	Inadequate Hydrological data	Lack of cooperation from locals	Lack of coordination among institutions and actors	Poor governance in general
			Total frequency	4	4	3	2	3
R1. Mr Yonas	"I would say the major hindrance to water governance is the lack of institutional setups in general. There's really no government or societal institutions that actually administer water that could.... In fact, if you look at Ethiopia, relatively good governance may be seen in only the Awash basin but for the rest of the river basins they lack those institutions and structures that support what governance."	Institutional setup and structural problems	1					
R2. Mr Gebeyaw	there is competing interest from all the riparian countries. For example, Egypt and Ethiopia have their interests and the rest of the other countries. This makes water governance very difficult in the Nile Basin and specifically in the Upper Blue Nile.	Competing interests		1				
	Ethiopia has weak institutions and since water is governed by these institutions water governance is not effective.	Institutional setup	1					
R3. Dr Mekete	Inadequate hydrological information on the Blue Nile. In theory we have good water resources but practically watersheds are highly affected by land degradation and soil erosion that makes it difficult to quantify.	Inadequate Hydrological data			1			
	There is also competing interests that leads to conflict.	Competing interests		1				
		Environmental challenges						
R4. Dr Muleketa	The first is that we don't properly know the resources of the Nile. In terms of when we have how much and where we have how much. In other words, the temporal and spatial distribution of resources on the Nile is still inaccurately assessed due to lack of knowledge and proper assessment	Inadequate Hydrological data			1			
	The other is that we have multiple of interests in the socio-economic environment. We need the resource to satisfy variety of our socio-economic interest.	Competing interests		1				
	Therefore, the challenge in governance the misunderstanding and lack of knowledge in properly assessing both the supply and the demand side.	Inadequate Hydrological data			1			
	Also, from upstream to downstream there are people living with diversified interests. In one area water is used for one purpose and in another the interest is completely different.	Competing interests		1				
R5. Miss Vivian	What about the administration and institutional setups? What does it look like? In the Nile you can find some strong institutions somewhere but in other areas the institutions are either weak or non-existent	Institutional setup	1					
	In the past free grazing was normal in areas around the blue. But in our efforts to protect the Nile we ask farmers to keep their livestock at home so we can rehabilitate the area they refuse. This impedes our ability to do our work.	Lack of cooperation from locals				1		
	The main challenge is anthropogenic. People are building house indiscriminately on area around the Nile. There is also the issue of recession agriculture.	Lack of cooperation from locals				1		
R6. Mr Hagos	However, the most urgent one is weak institutions to control and manage the Blue Nile. Institutions like the Nile Basin initiative are new and still haven't developed the dynamics to understand the Nile.	Weak Institutions	1					
R7. Anonymous	The major challenge is the lack of coordination among parallel institutions governing the Blue Nile basin. For example, in the Amhara region, there is lack of coordination between the Bureau of Agriculture, Bureau of Natural resources and the Bureaus of Water works and the Abbay river basin authority.	Lack of coordination among institutions and actors					1	
R8. Anonymous 2	I think the primary challenge to water governance is bad governance that is exhibited in the general governance system of Ethiopia. Therefore, the poor governance of the Upper Blue Nile is just a reflection of the overall poor political atmosphere of Ethiopia.	Poor governance in general						1
R9. Mr Tefara	Even though financing is a challenge, I think the biggest challenge we face is the coordination of institutions and sectors. As I mentioned IWRM requires the coordination of all the sectors related to water management.	Lack of coordination among institutions and actors					1	
R10. Mr Fekemed	One of the major challenges we have in the Eastern Nile is the lack of participation by all member states in the cooperation process. The Eastern Nile has 5 countries: Ethiopia, Egypt Sudan, South Sudan and Eritrea.	Lack of coordination among institutions and actors					1	

Appendix D: Improving Institutional Capacity on the Upper Blue Nile

No.	Responses	Themes	Watershed based management	Trainings and development	Coordinated decision making	Innovation	Political commitment	IWRM
		Total frequency	2	2	4	3	3	1
R1. Mr. Yonas	river basin authorities could be entry points to create watershed-based ideas to infiltrate the interregional governments and try to work together That is, it should start	Watershed based management	1					
R2. Mr Gebeyaw	Institutional capacity can be in the form of financial capacity or the general institutional capacity	Financial investment					1	
	This can also be done by given trainings especially know ledged based training.	Trainings and development		1				
R3. Dr Mekete	Institutions should be committed to practicing the ideals of IWRM	IWRM						1
	Every actor in the river basin should be committed to the common good of the Nile. The institutions are in existence but there is a lack of commitment and coordinated decision making.	Commitment Coordinated decision making			1		1	
R4. Dr Muleketa	We need to work on innovation because we cannot blindly copy technology from other river basins because we have different socioeconomic realities.	Innovation				1		
R45. Madam Vivian	Workers of the basin authority must also go through career training and development. Basin authority personally must first receive trainings first before they can also organise capacity building workshops for locals	Trainings and development	1					
	Sectors from both government and private sector must collaborated in managing water resources. Communities must work hand in hand with government.	Coordinated decision making			1			
R6. Mr Hagos	Institutions must also be established based on the principle above. Downstream, middle and upstream communities must work together	Coordinated decision making			1			
	Local Institutions should be established at the watershed level and then allowed to grow to integrate at the river basin level.	Watershed based management	1					
R7. Anonymous	Governments of all the Nile riparian states must accept instructional assistance from one another in order to ensure efficient utilisation of the resources on the Nile. Egypt for example has mastered irrigation on the Nile and could share their efficient systems with the upstream countries too to boost water conservation efforts.	Knowledge transfer				1		
R8. Anonymous 2	Staff of river basin institutions should be selected based on merit. Career training and development should be organized for workers to keep on top of new challenges.	Trainings and development		1				
	There should also be a conscious effort to include ICT in river basin management activities.	Use of modern technology				1		
R9. Mr Tefara	Efforts are currently in place to ensure institutions can collaborate in their management efforts. We have the ministry of water irrigation and energy, ministry of agriculture, ministry of livestock, ministry of environment and climate change. These are the four ministries that are focusing on watershed management or environmental management. There are also NGOs that are working on watershed management. So, we have started to work together by bringing the finances together. We have planned to do at least one common area, that				1			
	When this happens all countries that ratify the CFA will restructure their institutional arrangement in a manner that the fit the Nile basin commission.						1	
R10. Mr Fekan								

Appendix E: Support Letter from EiWR



**ETHIOPIAN INSTITUTE OF
WATER RESOURCES**
ADDIS ABABA UNIVERSITY

ቁ፡፱ር

Ref.: EiWR/243/11/19

Addis Ababa, Monday, 18 March 2019

Embassy of Federal Democratic Republic of Ethiopia
07, Chemin Doudou Mokhtar
Ben Aknoun, Algiers,
ALGERIA

RE: Support Letter for Entry Visa to Mr. Kwabena Fynn Fletcher

Dear Sir/Madam:

The Ethiopian Institute of Water Resources (EiWR) in Addis Ababa University is conducting a multidisciplinary research, education and community outreach activities under the motto "**Partnership for Building Ethiopia's Water Future**" and aspires to be among the top ten pre-eminent institute in Africa by 2025. Currently, the institute is a member of the AU/NEPAD Central and Eastern African Network of Water Centres of Excellence (AU/NEPAD CEANWATCE).

Therefore, on behalf of the EiWR and myself, I would like to extend an invitation for **Mr. Kwabena Fynn Fletcher** to join us as a self-funded visiting researcher for a period of three months from **25 April to 1 July 2019**.

Mr. Kwabena Fynn Fletcher is a Ghanaian citizen and MSc student of the Pan African University Institute of Water and Energy Science (PAUWS), Algeria. He is conducting his individual MSc research project entitled "**Measuring the Water Governance of the Upper Blue Nile River Basin**" under the supervision of Dr. Azage Gebreyohannes who is an Assistant Professor of Transboundary Water Management and Education Coordinator of the Ethiopian Institute of Water Resources (EiWR), Addis Ababa University.

We acknowledge that Mr. Kwabena is funded by his home university, Pan African University Institute of Water and Energy Science (PAUWS), Algeria. Moreover, please note that he is also aware of all Addis Ababa University policies, laws and regulations.

Therefore, on behalf of the Ethiopian Institute of Water Resources, I would like to request your good office to consider his visa application and enable him to enter Ethiopia If you require any further information, please do not hesitate to contact us.

Sincerely,

Dr. Bayou Chane Tegegne
Assistant Professor in Water Resources Engineering
Director, Ethiopian Institute of Water Resources
Addis Ababa University, ETHIOPIA



Encl: 2 pages of support letter from PAUWS and Mr. Kwabena

ETHIOPIAN INSTITUTE OF WATER RESOURCES
AKAKI CAMPUS, P. BOX. 150461
ADDIS ABABA UNIVERSITY
ADDIS ABABA, ETHIOPIA

Tel: 251-114-341698
Fax: 251-114-349417

Website: www.eiwr.org
www.aau.edu.et

Appendix F: Allocation of research grant

SUMMARY OF MONTHLY COSTS		
Month/Activity		Cost
March		
Internet cost for 1 month		100
Visa for 3 months		75
Travel Insurance for 3 months		40
Subtotal		215
April		
Internet cost for 1 month		100
Printing of questioners		150
Domestic Return Flight (Tlemcen-Algiers)		100
International return flight (Algiers - Ethiopia)		1000
Domestic Return Flight (Addis - Bahir Dara)		120
Subtotal		1470
May		
Field work Transportation (2 weeks for 2 people)		250
Local translator		150
Procurement of recording device		80
Contingencies		170
Subtotal		650
June		
Miscellaneous and Stationary costs		100

SPSS Subscription for two (2) months)		250
Internet cost for 1 month		100
Subtotal		450
July		
Policy brief\Publication		150
Subtotal		150
Grand Total		2935



ENTRO
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Ref: ENTRO/303/2019
Date: April 30, 2019

Ref: ENTRO/303/2019
Date: April 30, 2019

To Whom It May Concern

The Eastern Nile Technical Regional Office (ENTRO) is one of the three (3) centres of the Nile Basin Initiative (NBI). ENTRO was established by the Ministers for Water Affairs of the four Eastern Nile Countries of: Egypt, Ethiopia, South Sudan and Sudan to implement the Eastern Nile Subsidiary Action Program (ENSAP) whose overall objective is the cooperative development and management of the water resources of the Eastern Nile Region in a sustainable and equitable manner. To implement ENSAP, ENTRO work with Eastern Nile Water Affairs Ministers experts.

ENTRO has taken the initiative to establish internship program as part of its core activities and has successfully implemented the program in the last seven years. One of the objectives of the program is to strengthen Eastern Nile cooperation by creating a knowledge community of young professionals. In addition to that ENTRO hosts an intern visiting students and researchers.

Mr. Kwabena Fynn Fletcher, is from Pan African University of Algeria and conducting his MSc thesis research on the Upper Blue Nile Water Governance. Mr. Fletcher is hosted by ENTRO as an Intern starting April 27, 2019.

This is, therefore, to kindly request your cooperation to grant him access to relevant data from your organization and to meet with responsible personnel in your firm as needed.

Sincerely,

Fekahmed Negash
Executive Director



*Faculty of Civil and
Water Resources eng
Please cooperate and
assist staff that
can be interviewed.*

ENTRO is an organ established to implement the Eastern Nile Subsidiary Action Program within the framework of Nile Basin Initiative

Egypt, Ethiopia, South Sudan, Sudan

Appendix H: Sampling guide

Participant Selection for Data Collection
Community Leaders
I want to interview two community leaders who are very familiar with the economic and social activities of the Upper Blue Nile area.
NGOs
Two upper management members of two NGOs involved in the water and sanitation sector in the Lake Tana region.
Water User Association
Two top members of any farmers union that rely on the Upper Blue Nile for irrigation water.
Private Sector
Any private business entity that is relying on any part of the upper Blue Nile for resources. (private flower farmers)
Domestic Water Supply Company
A top official of domestic water supply company on the Upper Blue Nile river.
Researchers (Professionals)

Participant Selection for Data Collection
About two or three researchers on the Upper Blue Nile River basin (preferably from Bahr Dar University).
Government official
Any government official who can give an insight into the plans and projects of the government of Ethiopia on the Upper Blue Nile river.

