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Presented by

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**Optimizing the Benefits of Water Cooperation on Transboundary Rivers: A Case of  
Blue Nile River**

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## DECLARATION

I, **Rehima Kedir Mohammed**, 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 ethics.



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## **Dedication**

I dedicate this project to my beloved Mother Fatuma Jeyilan, my source of inspiration, knowledge and strength.

## **Acknowledgements**

My deepest gratitude goes to Almighty God who has provided 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.

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## ABSTRACT

Transboundary water cooperation leads to the sustainable water resources development, peaceful management and efficient use of freshwater resources. However, the management of Transboundary River is complex by the fact that they cross political and administrative boundaries indiscriminately. Demand for fresh water supply in the entire Blue Nile River Basin is constantly increasing due to economic development and population growth. Unilateral developmental action by riparian countries is also another challenge on the management and utilization of scarce water resource in the basin. The study suggests that optimizing the benefits of water cooperation on the Blue Nile River or 'Abbay' as it is known in Ethiopia' would enhance mutually beneficial collaboration among the riparian countries.

The study used semi-structured key informant interviews as a method of qualitative data collection for triangulating and refining the analysis and discussion. Purposive sampling employed to select executives, senior management staff, researchers and academicians that are especially knowledgeable about or experienced with an area of study. Nineteen key informant interviews were conducted based on the reason that respondents provide in-depth information about, research objectives and their knowledge for the study.

The study finding indicates that there are different type of benefit that can be generated from cooperation and joint actions on the transboundary Blue Nile basin such as hydropower generation and irrigation, environmental sustainability, peace and security in the region, knowledge and information sharing. The analysis on the benefits of cooperation shows that 22% of the benefit in the basin can be generated from direct economic benefit, 23% are due to benefit to the river, 16% of benefit can be obtained from hydro politics and 15 % is benefit beyond the river. Most interviewees highlighted that environmental degradation, lack of data sharing, lack of trust and instability, and underdevelopment are among the cost of noncooperation on the management and utilization of water resource in the basin.

The study highlights that on ensuring the benefits and sustainable development of the Nile River basin, there should be a win-win development strategy, adaptive-integrated water management approach, appropriate transboundary water policy and planning, adequate institutional arrangement and legal frameworks to overcome the water related problems in the basin.

**Key words:** Cooperation, Transboundary, Benefit, Blue Nile, Hydro politics

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## LIST OF ABBREVIATIONS

<b>AMCOW</b>	African Ministers' Council on Water
<b>BC</b>	Benefit of cooperation
<b>CN</b>	Cost of noncooperation
<b>CVR</b>	Content Validity Ratio
<b>GERD</b>	Great Ethiopian Renaissance Dam
<b>KII</b>	Key informant interview
<b>LCBC</b>	Lake Chad Basin Commission
<b>LVBC</b>	Lake Victoria Basin Commission
<b>LVFO</b>	Lake Victoria Fisheries Organization
<b>LTA</b>	Lake Tanganyika Authority
<b>OCC</b>	Observed Challenge of Cooperation
<b>NBA</b>	Niger Basin Authority
<b>NBI</b>	Nile Basin Initiatives
<b>RC</b>	Recommendations
<b>SADC</b>	Southern African Development Community
<b>UN</b>	United Nations

## DEFINITION OF KEY CONCEPTS

**“Water cooperation”**: refers to the peaceful management and use of freshwater resources at local, national, regional and international levels among the various players and sectors. The concept of water cooperation entails working together towards a common goal, in a way that is mutually beneficial (UNU -DPAC, 2013).

**“International Rivers” or “Trans boundary Rivers”**: Fresh water whose basins are situated within the border of more than one state (Claudia W.Sadoff and David Grey, 2002).

# CHAPTER I

## INTRODUCTION

### 1.1. Background

Freshwater bodies that connect two or more countries, either above or below the surface, cover about 45% of the world's land mass (Srodijidin, Joesefina, & Olcay, 2015). Rivers are extraordinary phenomena with physical, cultural and psychological expression in human societies: they bring life and death, civilization and devastation, opportunity and risk (Claudia & David, 2002). The management of the river is complicated by the fact that they cross political boundaries indiscriminately because, there is no boundary in Water. Numerous countries are unlikely to share the same watercourse at the upper, lower or middle course. And this is also why numerous river basins become the shared property of two or several sovereign states. There are about 260 rivers that cross or form international border: their basin covers almost half the world's land surface and include about 40% of the world's population (Wolf A.T, 1998). On the other hand, there are 215 shared river basins around the world and these are distributed as follows: 57 in Africa, 35 each in North and South America, 40 in Asia and 48 in Europe Elhance (1999: 4 – 5) cited in (Arsano, 2007).

All international rivers without exception create some degree of tension among societies that they bind (Claudia & David, 2002). The increased competition over freshwater resources inevitably entails conflict between riparian states. Non-cooperation on an international river will result in tension between states that will always be present, to a great or lesser extent, and that tension will generate cost. Tension arising because of a river, particularly when they are acute or long standing can thus significantly strain broader relation between state and impact the political economy of the region (Claudia & David, 2002). Tense international relations tend to inhibit regional integration and manifest themselves in the fragmentation of market, transport, labor flow, financial system etc. By the same token, cooperation with regard to shared water contributes to strengthen relation between countries and catalyze brooder cooperation, integration and stability. There are 276 international river basins, of which 60% do not have any framework in place to manage these shared resources cooperatively. This could be cause for concern, as water resource issues have heightened tensions throughout history (Srodijidin, Joesefina, & Olcay, 2015).

“Water cooperation” refers to the peaceful management and the use of fresh water resources at local, national, regional and international levels among the various players and sectors. The concept of water cooperation entails working together towards a common goal, in a way that is mutually beneficial (UNU -DPAC, 2013). Cooperation on international rivers could enable better management of ecosystems, providing benefits to the river, and underpinning all other benefit that can be derived (Claudia & David, 2002). Cooperation facilitates the exchange of data and information and can help develop joint management strategies to preserve water resources and protect water-related ecosystems. Cooperation is necessary to address issues such as water allocation decisions, upstream and downstream impacts of water pollution and water abstraction, infrastructure development, overexploitation, and financing of water management (UNU -DPAC, 2013). Cooperation on the management of the river can catalyze flows other than water between the countries, by diminishing regional tension, increasing production and promoting broader regional integration and cooperation (Claudia & David, 2002). Cooperation promises substantial economic benefits, as well, including access to external markets, improved management and coordinated operation of water infrastructure, and optimal location of infrastructure, to name a few. Additionally, joint development of a shared river can increase the sustainability of the resource, and help the needs and interests of all countries involved. The increasing need for cooperation on trans-boundary waters is viewed as a shift from the ‘traditional national security’ perception to a ‘common security’ perception.

Africa has 63 river basins, of which 20 have international agreements in effect and 16 with institutionalized transboundary forums. Progress has been made over time, with areas in South Africa having more equitable rights established than when apartheid policies were in place. Many continental, regional, and national organizations have been developed to focus on cooperation, like the Southern African Development Community (SADC), the Niger Basin Authority (NBA), Lake Chad Basin Commission (LCBC), Lake Victoria Basin Commission (LVBC), Lake Victoria Fisheries Organization (LVFO), Lake Tanganyika Authority (LTA), and the African Ministers’ Council on Water (AMCOW). SADC created a Protocol on Shared Watercourse Systems in 1995 that later was revised and adopted to be in line with the 1997 UN Watercourses Convention.

The Nile is 6,695 kilometers long, making it the longest river on earth. Its catchment area covers around a tenth of the surface of Africa, and is home to almost a quarter of the African population. For these people, the river is by far the most important freshwater reservoir in the region. Demand for water in the entire region is constantly increasing due to economic development and population growth. Taking into account high rates of population growth, some of the highest levels of poverty in the world and ever-present underlying political differences, the Nile basin became one area of the world where competition will grow. Water resources are already being intensively utilized, and climate change and land use changes are also having a negative impact on water availability. The Nile Basin is therefore classed as one of the most conflict-prone river basins. Ten countries share the Nile: - five are among the ten poorest countries in the world; four are land locked and seven are on, or recently have been, involved in internal or international conflict (Claudia & David, 2002). In view of the on-going Nile Basin Initiative (NBI) the basin is divided into two sub-basins, namely the Eastern Nile and the Equatorial Nile. The Equatorial Nile sub-basin comprises Burundi, DRC (Democratic Republic of Congo), Kenya, Rwanda, Tanzania and Uganda (Arsano, 2007) while, the Eastern Nile Basin (ENB) includes parts of Egypt, Ethiopia, Sudan and South Sudan. It covers some 1.7 million square kilometres and comprises four sub-basins: the Baro-Akobo-Sobat-White Nile, the Abbay-Blue Nile, the Tekeze-Atbara and the Main Nile from Khartoum to the Nile delta. The Eastern Nile Basin is a water scarce region. About 86% of the water of the Nile is generated in very limited watersheds of the highlands of Ethiopia (16% of the total area of ENB) and for most of its course of nearly 7000 kilometres the Nile flows through a desert, incurring huge evaporation and conveyance losses (ENTRO, 2017)

The Blue Nile (or Abbay as it is known in Ethiopia) river begins its long journey to the Main Nile from Lake Tana at an elevation of 1,800 meters above sea level (MASL) in the highlands of the Ethiopian plateau and flows through Ethiopia and then into Sudan before making its confluence with the White Nile in Khartoum at an elevation of about 350 MASL. The richness of the natural and human resource base, notwithstanding, the basin's peoples face huge challenges: The incidence of poverty is high, and with high population growth rates the pressure on the natural resource base and ecological systems is enormous and increasing. Poverty reduction efforts are constrained by land degradation, underdevelopment of water resources, high sediment loads and consequent sedimentation of dams and irrigation canals, the loss of products and

services provided by forests and wetlands, and the overgrazing of rangelands and declining biodiversity (ENTRO, 2017).

## **1.2. Statement of the problem**

Africa is still faced with huge water challenges that cross borders. While rivers may have coordinated cooperation in many places of the continent, groundwater resources lack institutions. Political instability, mass migration, and limited resources have made cooperation difficult. Despite the evidence that such cooperation would be highly beneficial to countries when compared to unilateral development and management and despite the fact that many countries have successfully negotiated treaties or other agreements with their riparian's we still find many basins where formal cooperation between riparian's is lacking, or even obstructed by one party or another. There are many cases of a country not joining its riparian's in negotiating a basin agreement, e.g. On the Nile (Ashok, Bridget, & Aron , 2014).

At present, there are no legal or institutional arrangements to harmonize upstream-downstream water utilization interests at sub-basin or basin levels. Nor are there any mutually acceptable customary modalities, which might be acceptable for inter-riparian water utilization and management. Due to the lack of adequate upstream-downstream water utilization and management, all three riparian countries of the Eastern Nile have been challenged by various complex problems: excessive erosion and soil loss in upstream Ethiopia; flood and silt accumulation in the midstream Sudan; and excessive water loss through evaporation in downstream Egypt.

Recently, many countries have started paying more attention to integrated approaches towards management of water together with other key sectors of the national economy. However, in many cases the national plans of IWRM have not been coordinated either at the Transboundary level or with relevant regional strategies. For this reason, many IWRM plans have not reached their full potential or effectiveness (Srodijidin, Joeseфина, & Olcay, 2015). Since 1999 a pas breaking multilateral effort termed the Nile basin initiative (NBI) has underway among the Nile riparian's to promote cooperation and explore opportunities for maximizing the benefits of the river water through cooperative management and the basin system. Yet there has been virtually less explicit discussion on the different benefits of cooperative water resource development from a

countrywide perspective. It will be important that this study is conducted to assess the different benefits of water cooperation in transboundary river case of the Blue Nile (Abbay) River.

### **1.3 Research Questions**

The key research question of the study is:

#### **What are the substantial benefits of water cooperation that contribute to sustainable development and management of the Blue Nile River Basin?**

The following are a list of sub research questions emerged to answer the problem indicated in the above statement of problem:

- i. What is the role of water cooperation on the environmental sustainability of the transboundary Blue Nile River?
- ii. What are the economic values of water cooperation on the transboundary Blue Nile River?
- iii. How tensions decreased because of cooperation on transboundary River?
- iv. How transboundary water cooperation contributes and maximizes the socioeconomic and political integration among the Eastern Nile countries?

### **1.4. Objectives of the study**

#### **1.4.1. General Objective**

The general objective of the study is to identify and optimize all the benefit of water cooperation in the Blue Nile River that contributes to the sustainable development and management of the transboundary River basin.

#### **1.4.2. Specific objectives of the study**

- i. To determine the role of water cooperation on the management of ecosystem on the transboundary Blue Nile river.
- ii. To examine the economic value of water cooperation on Trans boundary Blue Nile river.
- iii. To highlight the importance of cooperation and water networking to reduce tensions that may come from ever increasing and competitive water demand in the basin countries.
- iv. To analyses water cooperation on economic integration between Ethiopia and other riparian state.

### **1.5. Expected output of the study**

In this study it is expected that Water cooperation has positive impact on the management of the ecosystem, increase economic value, increase political value and economic integration. Cooperation on Blue Nile River basin contributes to the sustainable development and management of Transboundary Blue Nile River basin.

### **1.6. Key beneficiary of the study**

The key beneficiary of the study will be miniseries, decision makers, policy makers, planners, river basin organization, researchers, etc...

### **1.7. Significance of study**

This study may serve as a reference material for the decision makers (e.g. Ministries) and development agencies, institutional bodies, researchers and stakeholders.

The study may help policy makers to consider accurate data and information on water and related natural resources for informed decision-making and policy-formulation at the national and regional levels.

This study may also help policy makers to consider legal frameworks for clear rights and obligations and well-developed procedures for cooperation. And also, to consider legal frameworks for dispute prevention and resolution mechanism, optimizing the benefit of the river and management and protection of water resources and related ecosystems.

## 1.8. Scope of the study

### 1.8.1. Geographical scope

The study carried out in the Blue Nile (Abbey) River basin shown below. The sub-basin has an area of over 310,000 km<sup>2</sup> (ENTRO, 2017). Its catchment area is more than twice smaller than that of the White Nile, while its water contribution to the main Nile is more than four times as big as that of the White Nile (Arsano, 2007). The sub basin has a population of 39 million this sub-basin accounts for around 26% of the total population of the Basin and is the second most populous of the four sub basin after the main Nile sub Basin (ENTRO, 2017).

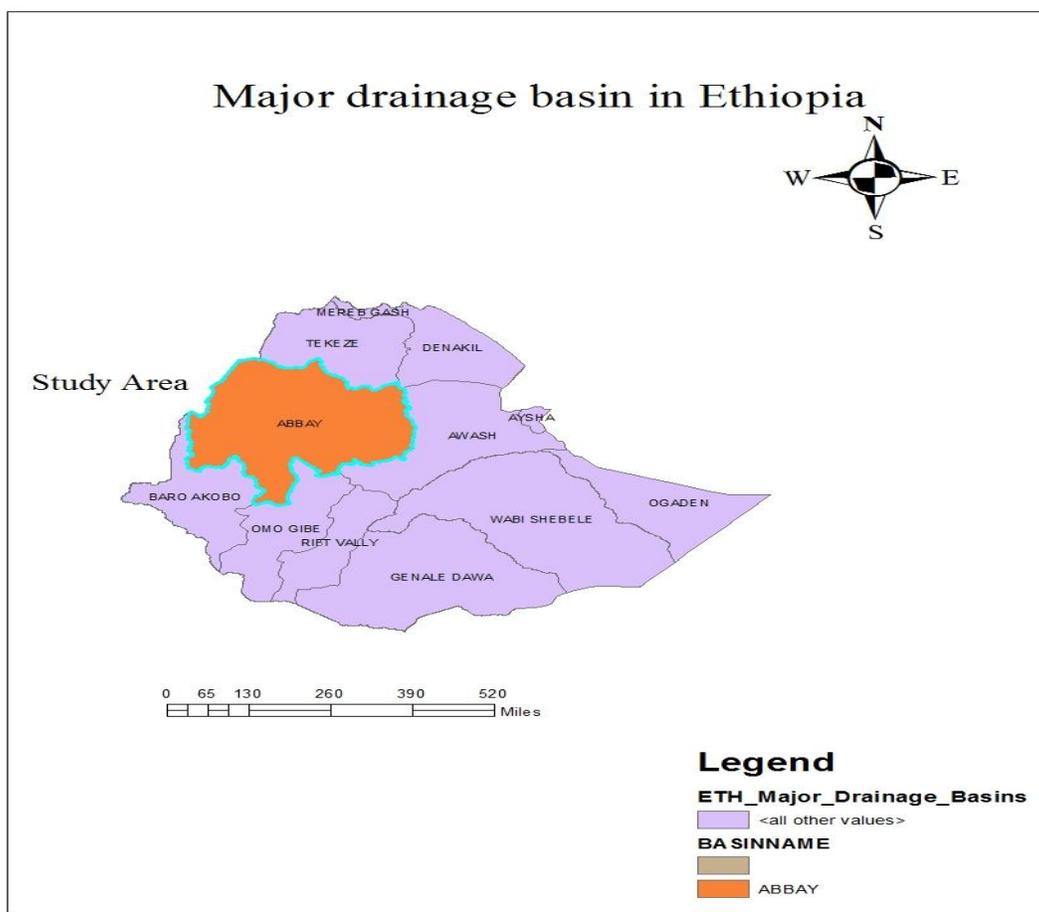


Figure 1.1 Study Area and Major Drainage basin in Ethiopia

### 1.8.2. Time scope

The study covered from a period of development of cooperative framework and the Nile basin initiative (NBI) that is 1995 up to 2017 because it is a time where establishment of NBI and the negotiation of the cooperative framework between riparian countries as a new.

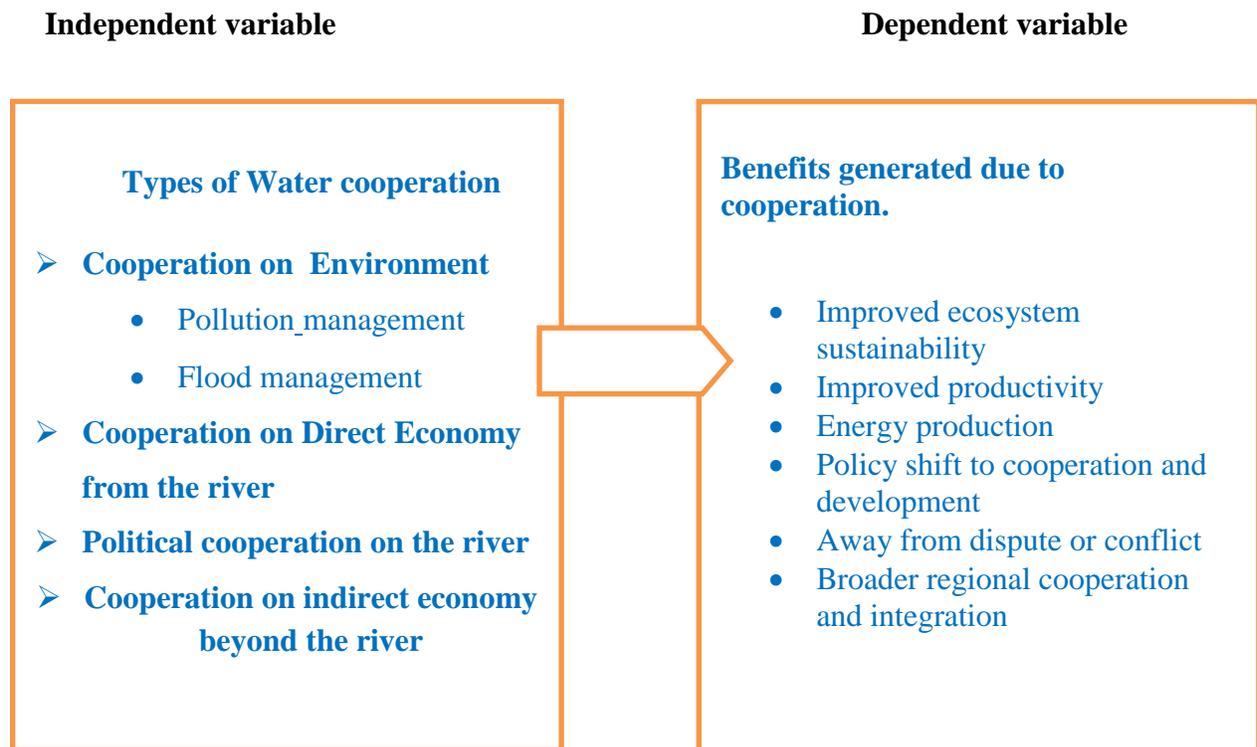
### 1.8.3. Subject scope

The study focused on the benefit of water cooperation on the Trans Boundary River: case of the Blue Nile River. Benefit of water cooperation assessed based on Environmental benefits, direct socioeconomic benefits, hydro politics benefits and indirect economic benefits.

### 1.9. 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 that: the relationship between the independent variable which is types of water cooperation and the dependent variables which is benefits generated due to cooperation.



## **CHAPTER II LITERATURE REVIEW**

### **2.1. Introduction**

In this chapter, related literature about Benefits of water cooperation on Trans boundary water uses will be reviewed. The objective here is to reveal the contributions made by earlier researchers, identify the weaknesses and gaps in the existing knowledge and highlight the lessons learnt from their studies. The chapter is composed of sections which include theoretical review, conceptual review, summary of the literature review and related studies done by previous researchers. Literature will be obtained from textbooks, journals, internet and documents from the Ministry and basin organizations.

### **2.2. Theoretical Review**

Conflicts have existed in all cultures, religions, and societies for as long as humans have walked the Earth (UNU -DPAC, 2013). Philosophies and procedures for dealing with conflicts have been part of human heritage and differ between cultures and societies. Nations, groups, and individuals have tried throughout history to manage conflicts in order to minimize their negative and undesirable impacts. Conflicts can develop in any situation where people interact and where two or more persons, or groups of people, perceive that their interests are opposed, and that these interests cannot be met to the satisfaction of all the parties involved (UNU -DPAC, 2013). Conflicts may not be resolved easily, and can last many years. Sometimes these conflicts persist in spite of the fact that they cause heavy losses of resources, and even human life.

‘Transboundary water conflict’ is defined as verbal, economic, or militarily hostile actions between stakeholders over internationally shared water resources (Petersen, Jennifer, & Arron, 2017). Since 1948, there were only 37 incidents of acute conflict between riparian states over water involving violence. In the same period, 295 international water agreements were signed (WWAP, 2003). In recent years, there has been an increase in reported cases of water-related disputes and violence (Gleick & Matthew, 2012). Part of this increase is almost certainly due to improvements in reporting; new Internet tools that permit more comprehensive collection and dissemination of news, data, and information; and more widespread awareness of the issue. But it is also possible that part of the increase is due to growing tensions and disputes over limited freshwater resources and the unresolved political challenges associated with “peak water”—the limits imposed on the availability of both renewable and nonrenewable water resources (Gleick &

Matthew, 2012). Others have also expressed this hypothesis, based on estimates of growing absolute and per capita scarcity of water, water contamination, and the extensive reliance on agriculture and some urban uses on nonrenewable sources of water that are rapidly being depleted (Gleick & Matthew, 2012).

This idea is also at odds with some academic and popular writing that argues that the fear of water wars is overblown (Karmer, Aron, Carcus, & Dablelko, 2013). Part of that argument is based on the observation that there are substantial numbers of historical agreements and political treaties over shared interstate water systems and a long history of cooperation and negotiation when disputes develop. But the argument against water “wars” is different from the broader issue of water-related conflicts. And it is somewhat of a “straw man” argument: the “water wars” discussions are almost always found in the popular media, not academic analyses, and while wars are almost never solely or primarily about water, water-related violence, at many different scales, does occur (Gleick & Matthew, 2012). The data suggest that the challenges of water conflicts are growing, not shrinking, especially at the subnational scale. Far better mechanisms and far greater efforts are needed to address these kinds of conflicts (Gleick & Matthew, 2012). While the underlying reason for water related controversy can be numerous such as power, struggles and competing development interest all water disputes can be attributed to one or more of three issues quantity, quality and timing (Aron & Anika, 2005).

Although there are many links between water and conflict and computing interest are inherent to water management most disputes are resolved peacefully and cooperatively even if the negotiation process is lengthy (Aron & Anika, 2005). According to (Srodijidin, Joesefina, & Olcay, 2015), Water cooperation, defined in its broader scope, covers various levels of interactions between and among the parties, stakeholders, and sectors that are involved in the development, use and management of a water resource; in the delivery of water services; or are impacted from either the actions or the consequences of such involvement.

There are 276 international river basins, of which 60% do not have any framework in place to manage these shared resources cooperatively (Srodijidin, Joesefina, & Olcay, 2015). Establishing a mutually acceptable mechanism of water and power resources management that takes into account the interests of both the upstream and the downstream countries can contribute to mutually beneficial long-term cooperation among the countries and their sustainable

development. Besides being a catalyst for peace and security, water cooperation is important for development. More than 200 water treaties have been negotiated over the last 50 years. As more pressure builds on the world's water resources, previous experience cooperating towards water sustainability serves as useful guidance for future agreements (Srodijidin, Joesefina, & Olcay, 2015). Evidence shows that cooperation has endured and has served and serves every day to manage differences in interests successfully. This has been the case with the more than 50 years of standing water cooperation between such diverse partners, such as Finland and Russia the long history of cooperation among irrigation farmers in Mediterranean countries, and in India (Kulkarnis & Ctyagi, 2013). According to Sadoff and Grey (2002) cited in (Rawia, 2016), four types of benefits could be achieved from this cooperation. The first type is benefits to the river (environmental benefits), which may include enhancing water quality and flow, improving watershed management, reducing sediment transport, and protecting biodiversity. The second type is benefits from the river, which refers to economic benefits from hydraulic projects constructed on the shared river. The social and environmental impact of such projects cannot, however, be ignored. The third type is the reduction of costs because of the river (political benefits), which is associated with reducing the tensions resulting from conflicts over water resources. The last type is benefits beyond the river (indirect economic benefits) which includes returns of cooperation in other fields, including increasing trade relations, investments and hydropower interconnections. The concept of benefit sharing may be useful not only in underlining the range of benefits that accrue from cooperation, but also in identifying the mechanisms by which riparian states share benefits (and costs), the factors that may influence a state's decision to engage in benefit-sharing negotiations and arrangements, and the policy options that could facilitate concluding a cooperation agreement (Rawia, 2016). To facilitate cooperation, (Claudia & David, 2005) recommended that the parties expand the perception of benefits to include more than one of the four types identified above and to explore the distribution of benefits and costs in a way that is seen as fair to all riparian states involved through the use of the compensation, joint funding and ownership, and extracting benefits from unrelated projects.

### **2.3. Disputes over a shared River Nile**

The period of 1956–1958 witnessed serious disagreement between Sudan and Egypt over sharing of the Nile. Coinciding with the Sudanese objections to the proposed Aswan High Dam, Egypt withdrew from their previous agreement to enable Sudan to build the Roseires Dam on the Blue

Nile. The relations deteriorated further when Sudan declared unilaterally its non-adherence to the 1929 Agreement (Warburg 1991) cited in (Swain, Ashok, 2011)

Swine (2011) mentioned in his article the dispute between Sudan and Egypt on the utilization of Nile water after the 1959 agreement signed between them. “As Sudan needs more water to meet the demand of its food production, there have been continuous demands from the Sudanese side to revise the 1959 agreement in order to increase its share; however, Egypt was absolutely against it. In the 1990s, the Sudanese officials repeatedly started using the threats of withholding the Nile waters from Egypt. Sudan’s alleged hand in the unsuccessful attempt on the life of the Egyptian President Hosni Mubarak at Addis Ababa in June 1995 brought further deterioration to the bilateral relationship. In this charged atmosphere, Hassan al-Turabi, the leader of the National Islamic Front (NIF) of Sudan threatened to stop the water to Egypt by redirecting the Nile’s flow. This brought panic to the Egyptian authorities and initiated hectic official deliberations in Cairo. President Mubarak aggressively responded, Those who play with fire in Khartoum ...will push us to confrontation and to defend our rights and lives” Similarly, his Foreign Minister declared, “I am warning Turabi not to play with fire, at the same time, not to play with water” (Nassar 1995)”

(Nunzio, 2013) Mentioned in his report, “The future of transboundary water disputes over the world’s longest river” the conflict that downstream countries (especially Egypt) had with other Nile riparian countries on the utilization of Nile water; in 1988, Egypt’s Foreign Minister, Boutros Boutros-Ghali, hypothesized that the Nile River would undoubtedly spark Egypt’s next war. Historically, Egypt has imposed its control over the Nile, granted through the 1902, 1929 and 1959 colonial agreements, on other Nile Basin nations. In 1970, Egypt threatened war over the building of the Fincha Dam in Ethiopia and when Ethiopia tried to secure funding from the World Bank, Egypt and Sudan invoked Article 3 of the 1902 treaty between Britain and Ethiopia. He also mentioned that; in 2004, Tanzania planned the construction of the Lake Victoria pipeline, which would have benefited approximately 400,000 of its northwestern citizens. Egypt threatened to bomb the construction site, claiming that it needed that water to flow northward into the Aswan Dam. The 1929 agreement restricted Tanzania from blocking the Nile’s waters without British permission. Egypt views the construction of Africa’s largest dam as a threat to its national security, given the vulnerability of its declining water supplies. The temporary diversion of water

flows along the Blue Nile tributary in May, allowing for a new phase of the GERD's construction, prompted Former Egyptian President Morsi to suggest that if Egypt's share of the Nile's water diminishes by one drop, that 'blood' would be the alternative.

Throughout the 20th century, economic constraints, external pressures and internal conflict have not allowed upstream countries of the Nile basin from developing their water resources, allowing Egypt to take full advantage of downstream water flow. As Egypt receives only very limited amounts of rain, it is highly dependent on irrigation by the Nile for sustaining its agricultural production. It therefore opposes any upstream project that could reduce downstream river flow. While the construction of hydro-power facilities on the Nile tributaries does not necessarily lead to lower downstream flows, the government of Egypt is nevertheless worried that upstream damming projects might open avenues for irrigation projects and water diversion in the future (Swain, Ashok, 2011).

#### **2.4. Forms of Cooperation on the Nile River**

In the Nile basin, there have been different phases of cooperation;

The first attempt of cooperation through basin wide organization is known as Hydromet, hydro meteorological survey of the Equatorial Lakes which was established in 19 67. All riparian countries were members except, Ethiopia and DRC which had observer status. It was formed in response to flood disaster. Its main purpose was to study, analyze and disseminate to member countries meteorological data on the equatorial lakes and rivers. The more specific task of Hydromet included an evaluation of water balances in the Lake Victoria catchments, in order to control and regulate the lake's level as well as the flow of water through the lake (Arsano, 2007).

The second one is the Undugu group, Brotherhood in Swahili, which was replaced Hydromet in 1983 with broader objectives of achieving a regional cooperation in the areas of environment, infrastructure, trade and culture. Undugu didn't bring together all riparian states as Ethiopia, Kenya and Tanzania opted to have an observer status (Michago, 2015).

The third one is the Technical Cooperation Commission for the Promotion and Development of the Nile (TECCONILE) which replaced Undugu in 1993. An important parallel activity in the effort to bring about basin-based cooperation was the Nile 2002 Conference series, which started in 1993 and continued up to 2002 (Swain, Ashok, 2011).The Nile River Basin Action Plan

(NRBAP), Policy Guidelines of the NBI and the formation of a “Cooperative Framework Agreement, (CFA) are some of the achievements of TECCONILE (Michago, 2015)

The forth one is the Nile Basin Initiative (NBI) which was established in February 1999, with a shared vision: “to achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile basin water resources.” The NBI has two tracks of cooperation: The NBI Technical projects and the Cooperative Framework Agreement (CFA), processes. The technical tracks focused on the implementation of shared regional projects such as environmental protection, regional power trade, confidence building and socioeconomic development. There are different achievements of NBI; the major achievement of the NBI are bringing all member states on the table and the ‘Nile Cooperative Framework Agreement, which was signed in May 2010 in Entebbe, Uganda, by the six upper riparian countries Ethiopia, Rwanda, Tanzania, Uganda, Kenya and Burundi. Even if the spirit of transboundary cooperation was high and thinking ‘beyond the river’ seemed attractive, the nature of ‘NBI cooperation’ has gone through different rough roads. Even if riparian countries do not advocate unilateral developments openly as they used to in the pre-NBI time, they still quietly indulge in unilateral developments. The NBI is a transitional institutional mechanism until the permanent Nile Basin Commission (NBC) is established

#### **2.4. Nile water sharing agreements**

In 1929, Egypt and the British Government (on behalf of Sudan and the riparian countries of Lake Victoria) reached a water sharing agreement over the Nile water. Britain and Egypt agreed, inter-alia, as follows: (1) Egypt would take all the waters of the Nile except the 4 bcm to be retained in Sudan. (2) Egypt would supervise all water-related activities in the entire basin from source to mouth. (3) Britain recognized the “historical” and “natural” rights of Egypt with respect to the waters of the Nile (Arsano, 2007)

A new agreement on the sharing of the Nile River was reached in 1959 on Utilization of the Nile Waters between the United Arab Republic of Egypt and Sudan. From the newly-calculated annual flow of 84 km<sup>3</sup> of water at Aswan, Egypt was to receive 55.5 km<sup>3</sup> and 18.5 km<sup>3</sup> were allotted to Sudan. The remaining 10 km<sup>3</sup> were allotted for mean annual evaporation and seepage losses from Lake Nasser behind the Aswan High Dam. The agreement also included some provisions for regulating the storage created by the Aswan Dam (Swain, Ashok, 2011).Yacob arsano (2007) concluded in his book that the agreements authored by the colonial powers, as well

as the 1959 Sudanese-Egyptian treaty favored Egypt. Successive regimes in Egypt have wanted the agreements to continue to be recognized and accepted by the upstream countries. The upstream countries, on the other hand, are not willing to recognize or accept either the letter or the spirit of those agreements to which they are not a party and which do not benefit them in any way.

After years of meetings and deliberations, in June 2007, the Nile Council of Ministers drafted the Cooperative Framework Agreement (CFA). The CFA was expected to be signed in September 2007, and would have replaced the existing water agreement between Egypt and Sudan. Nile Basin States agree, in a spirit of cooperation, (a) to work together to ensure that all states achieve and sustain water security, and (b) not to significantly affect the water security of any other Nile Basin State.” Though the upper riparian countries are in favor of this formulation, Egypt and Sudan demand section (b) of the article to be changed as “Not to adversely affect the water security and current uses and rights of any other Nile Basin States (Swain, Ashok, 2011).Egypt and Sudan are opposed to the CFA, as they are apprehensive that it would take away their historical priority over the Nile water. In May 2010, seven upper riparian countries came together in favors of going ahead with the Cooperative Framework Agreement, ignoring objections from Egypt and Sudan. If the agreement is signed and ratified by the other two upper riparian countries it will pave the way for the establishment of the Nile River Commission. However, (Swain, Ashok, 2011) argues that without Egypt and Sudan, the Commission will not be in any way capable of addressing the water sharing issues of the Nile River; rather, it may be a major source of contention between upstream and downstream riparian states.

## **2.5. Future Pressures on the Nile Water and needs for cooperation**

The multiple insecurities of the ENB – including water insecurity, food insecurity and energy insecurity – are likely to be amplified and intensified with the impact of climate change, the rise in populations and growing urbanization (ENTRO, 2017). There will be high population growth in the Nile basin countries, particularly in the Eastern Nile basin countries. Population of the ENB has grown from 58.3 million in 1960 to 243.5 million in 2015 and will grow more than 330 million in 2030; average urban population distribution as a percentage of the totals will reach up to 37% (ENTRO, 2017). In 2025, Egypt’s population is expected to reach about 97 million and Ethiopia’s, 127 million experiences physical water scarcity (Egypt by about 630 m<sup>3</sup> and Ethiopia by about 840 m<sup>3</sup> per year and capita (Dalia, Karin, & Dan-Erik, 2015). Increasing

demand for food in the future will certainly bring further pressure on the scarce water supply (Swain, Ashok, 2011). The region's demographic and economic growth and the need to sustain the livelihoods of hundreds of millions of people have put increasing pressure on a river basin shared by eleven countries. 70% of the waters of Eastern Nile are generated in only 3-4 months, between the months of July to September, but there is also huge variation in the volume of river flow across the years: in dry years the flow can go as low as 40% of its annual average and in wet years, it can go as high as 140% of the average - and the dry years are getting more frequent, more prolonged and consecutive with climate change (ENTRO, 2017). The study by (Elsham, Seierstand, & Sorteberg, 2009) highlighted that; the situation in the Nile basin is further complicated by high uncertainties regarding future water availability. Detailed climatic predictions vary across emission scenarios and employed models, but experts generally agree that the Nile region will experience further warming, with higher increases in the north of the basin than in the south. As a result of higher temperatures and evaporation, total runoff in the Nile basin could decline by the end of the century. In the ENB there is a serious spatial and temporal variability of water resources.

The uncoordinated development action by riparian countries is also another problem that causes pressure on the water resource and could thus lead to conflict. Egypt is now busy constructing new projects on the Nile and bringing new desert areas under cultivation, thus making it further dependent on the Nile water. Sudan has also constructed a number of smaller barrages in Blue Nile system (Swain, Ashok, 2011). The new planned irrigation schemes in Ethiopia (and eventually in South Sudan), Egypt and Sudan are also planning to expand their irrigated agriculture. Currently, therefore, national irrigation projects are planned without taking much account of water availability across the ENB as a whole, likely climate change (ENTRO, 2017). Lack of cooperation and environmental degradation are becoming serious obstacles to development in the Nile Basin.

There is an opportunity to transform the Nile, through collaboration and tangible actions on the ground, into a unifying force that builds regional and international interdependence and promote economic activities. Cooperation could enable co-basin states to participate as partners in regional development activities and realize win-win potential (WUBETE, 2017). (Yacob Arsano, 2007) on his book also recommended that the only "civilized" way to maximize one's national

interest with respect to the utilization and management of the transboundary waters is by establishing mutual benefit or “win-win” mechanisms in a new and cooperative framework of diplomacy and with a possible legal/institutional arrangement. Regarding Nile River cooperation and development, scholars and hydrologists advise that future agreements on Nile should address issues related to cooperation, equitable use of water and the principle of insignificant negative impact; joint management and alleviation methods of water shortages; environmental and water quality issues and regional water markets and loans, among others.

### **2.8. Gaps in the Literature**

A clear understanding from various literature indicate that water cooperation is one of the major solution for conflict resolution in trans- boundary water resources, and also water cooperation is one of the way to gain different type of benefits from the river and beyond the river. Nonetheless, all cooperation and agreements are not fully achieved their target due to in adequate level of communication and networking among the basin stakeholders. In this respect therefore, Countries and Trans boundary Water resource organizations should endeavor to put in place of water cooperation and shown the value of the Water Conventions and actions to sustain and support long-term trans boundary collaboration

It is clear that the literatures above highlights greater cooperation on the Nile River will lead to better management and development of the river itself and in many cases and it also promote economic integration and regional security beyond the river. This therefore initiate for more investigation on substantial benefits of water cooperation that contribute to sustainable development and management of the Blue Nile River.

## **Chapter III**

### **METHODS AND MATERIALS**

#### **3.1. Introduction**

This Chapter explains the methodology of the study applied to carry out this research, optimizing the benefits of water cooperation on Transboundary Rivers based on parts of the Blue Nile river basin in Ethiopia. The section includes the research design, population and sampling techniques, sample, data collection methods and instrumentation, research procedure, testing of instruments, data analysis and ethical consideration.

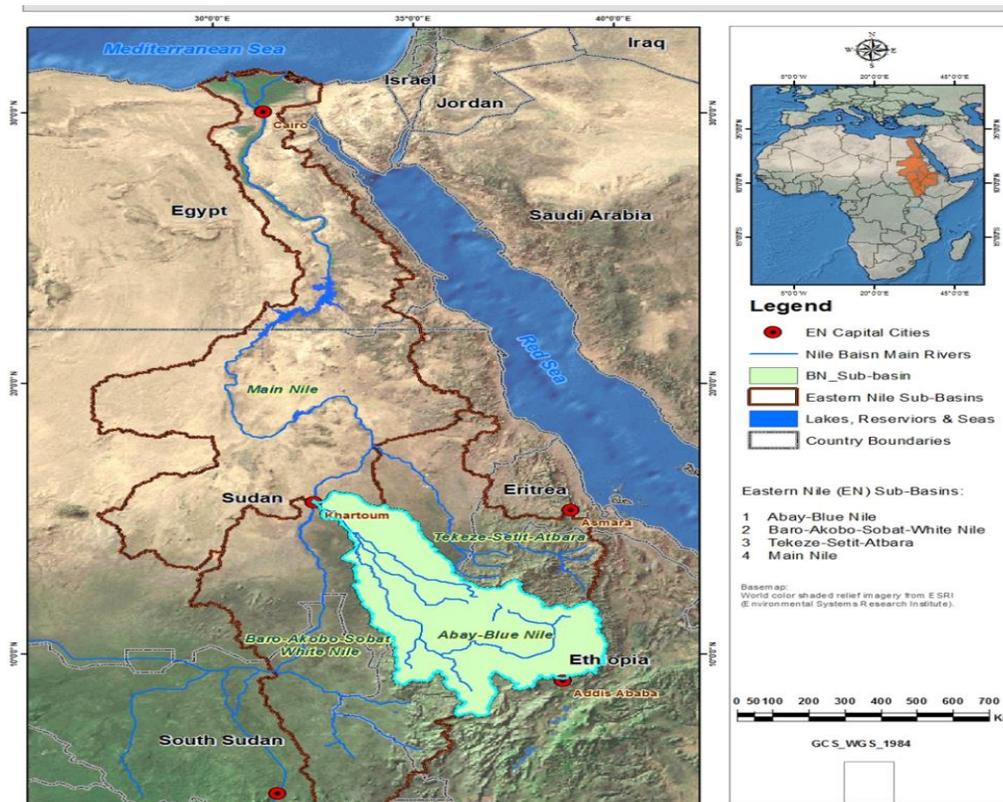
#### **3.2. Area of study and study population**

This study, Conducted at shared Blue Nile (or Abbay as it is known in Ethiopia) which begins its long journey to the main Nile from Lake Tana at an elevation of 1,800m in Ethiopia and flows into Sudan and meet the clear White Nile in Khartoum. The primary tributaries in Ethiopia are the Bosheilo, Welaka, Jemma, Muger, Guder, Finchaa, Anger, Didessa and Dabus on the left bank and the North Gojam, South Gojam, Wombera and Beles on the right bank. The sub basin has an area of 310,000km<sup>2</sup> with the population of 39 million. Most of the population around 25 million lives in the Abbay sub basin and the remaining 14 million lives in the Blue Nile sub basin. The Blue Nile basin is characterized by highly rugged topography and considerable variation in altitude. The elevation of the basin varies greatly from over 4000 m in the headwaters of some tributaries to 700 m at the foot of the plateau. The highest point in Lake Tana is about 1800 m and the river enters Sudan at an elevation of 490 m at the border of the two countries, i.e., with a gradient of approximately 1.5 m/ km. This gives the Blue Nile its unique feature of huge potential energy opportunity to develop hydropower. (Asegdew, Semu, & Mamru, 2018)

The study population consists of higher officials at ministry offices and different organizations, expertise from riparian countries and Researchers and academia at different universities and institutions.

The study population is chosen base for the reason that to collect different views and recommendations from researchers and academia from different universities (by considering their research and studies which they were conducted on the area) and higher officials at different

organizations and ministry office (by considering their organizational view and their experience on the area).



**Figure 3.1:** Map of Study Area in the Eastern Nile River basin. Source: adapted from (ENTRO, 2014)

### 3.3. Research design

The study used qualitative research design during sampling, data collection, quality control and analysis. A review of the relevant scholarly literature surrounding the topic served as the primary method of data collection, and provides the basis for the study’s analytical framework. The review covers topics that contribute to the development of the framework, as well as topics crucially linked to the benefits of water cooperation for sustainable development of riparian countries.

The study used Semi-structured key informant interviews as a Method of data collection for triangulating and refining the analysis and discussion, as well as a method of supplemental data collection. A predetermined set of sequenced, open ended interview questions was prepared by the researcher for use of interaction between the researcher and the respondent. Potential interviewees identified based on their position, knowledge and experience related to study topic.

The collected data obtained from interview organized and interpreted properly to extract the key findings of research work properly.

### **3.4. Sample size**

The nature of conducting the transboundary river basin research is complex, politically sensitive, difficult to measure, and involves more interaction with multiple actors. In a qualitative research approach, the literatures suggest that interviewing 5 to 25 respondents would help to capture reasonable information. With this justification, the researcher opted to take the maximum size, 19 respondents for conducting interviews that have adequate experience and principally involved in the Nile River basin water resources management and development activities. In addition, the process followed Zig-Zag approach between qualitative 'data collection' (Step 1, Step 3, Step 5, etc.) and 'data analysis' (Step 2, Step 4, Step 6, etc.) until it reaches saturation categories. At the end, the sample size for the interview was determined by the fact that the saturation point of data reached that is, in the data analysis where there is no further new information comes from the interview.

### **3.5. Sampling Techniques**

The study used non-probabilistic sampling techniques. From the existing non-probabilistic sampling techniques, purposive sampling employed to select executives, senior management staff, researchers and academicians that are especially knowledgeable about or experienced with an area of study. They were targeted due to their position and perceived knowledge arising out of known experience that they have. A Snow ball sampling technique used to facilitate the identification of respondents. Snow ball or chain sampling locate one or two individuals and then ask them to name other likely informants.

### **3.6. Data collection instrument**

#### **3.6.1 Interview Guide**

The goal of an interview is to gain rich, in-depth, personal experiences that relate directly to the research topic (Magnusson & Marecek, 2015). Interview guide used for the purpose of exploring many respondents systematically as well us to keep the interview focused on the desired line of action. 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

organization or institution and position in the organization) was asked as this information is useful for contextualizing people's answers. Interviews are conducted once only, with an individual and generally cover the duration of 30 min and more.

Recording of the interviews done in order to have the interview data captured more effectively and also recording of the interview makes it easier for the researcher to focus on the interview content and the verbal prompts.

Interviewees are chosen based on the reason that they provide in-depth information about research objectives or question and their knowledge and experience makes it easy to understand their impressions or learn more about their answers as compared to questions.

The interview takes place in a setting that is quiet (so there is no or little outside noise that might affect the quality of the tape recording) and private (so the interviewee does not have to worry about being overheard).

### **3.6.2 Document review**

This consisted of a list of documents concerning topics crucially linked to the benefit of water cooperation on the Blue Nile River in Ethiopia. In this case; textbooks, journals, magazines, thesis, conference papers, newspaper articles, government reports, internet, and dissertations related to the topic under investigation reviewed.

### **3.7 Ethical considerations**

Participants interviewed using a semi structured interview guide to provide relevant data that is helpful for the study. The information gathered from the participant kept confidential. There was no information that identified them in particular name. The findings of the study are generally for the study and are not reflected anything particular of individual persons. Participation in this study was fully 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 didn't enforce to answer any question that they don't want to answer.

### **3.8. Quality control and validity**

A literature review and pilot study was conducted, whether the questionnaire includes all the intended variables of the study.

### **3.9. Data processing and analysis**

A qualitative data transcribed from interviews and analysis of documents was organized and interpreted carefully in order to extract the key findings of the research. The study used an inductive approach to analyze the data this approach involves analyzing data with little or no predetermined theory, structure or framework and uses the actual data itself to derive the structure of analysis. The recorded interview data transcribed to gain detailed insight into the objectives being explored. A data coding system developed and linked codes or unit of data to form concepts which lead to the development of theory and graphs. The constant comparative method is used to analyse data by assigning codes that reflect various categories and property to a unit of data through sorting them into group of meaning. The coding process generates categories that flushed out by seeking relevant data bits that inform the category. Five category headings were generated from the data and under these all of the data were accounted for. Two independent researchers were asked to verify the seeming accuracy of the category system and after discussion with them; minor modifications were made to it. The final code system had the following (main) categories:

- Benefit of cooperation
- Cost of noncooperation
- Basin challenges
- Observed challenges of cooperation in the Basin
- Recommendations

Each of these categories had a number of subcategories and codes. The most important categories were “Benefits of cooperation”, “Cost of noncooperation”, “Observed challenge of cooperation in the basin” and “Recommendation”. The category “Basin challenge” was less central and served the purpose of collection additional information that could help interpreting the information coded under the main four categories.

## Chapter IV

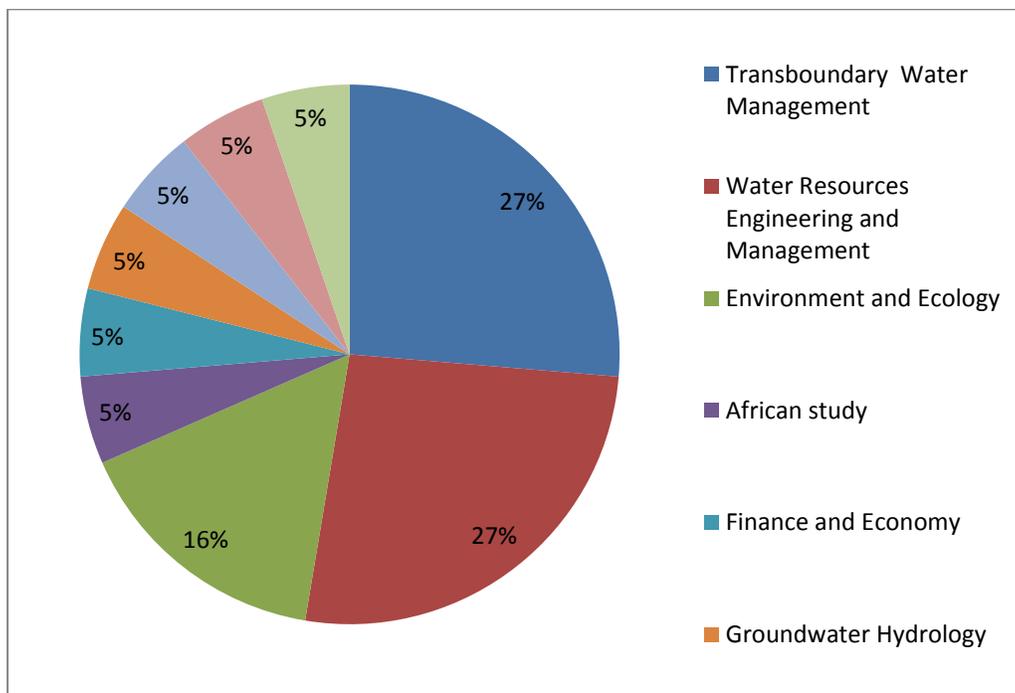
### PRESENTATION OF RESULTS

#### 4.1. Introduction

This chapter presents the actual findings of the qualitative data analysis without any interpretation of the analysis. It incorporates the most important findings of the analysis with a few informative words. Accordingly, the findings of the study indicate that the water resources in the Nile River basin are managed by different institutions with independent and sometimes overlapping responsibilities supported by various rules and regulation of each country, state basin authorities, regional administrative bodies and even grass root water user communities.

That is why the concept of optimizing the **benefits of cooperation** among the stakeholders is vital for sustainability of the basin water resources. Under this chapter, the specificities of the findings on the benefits of cooperation, the costs of non-cooperation, observed challenges in the basin and Recommendations of interviewees will be presented.

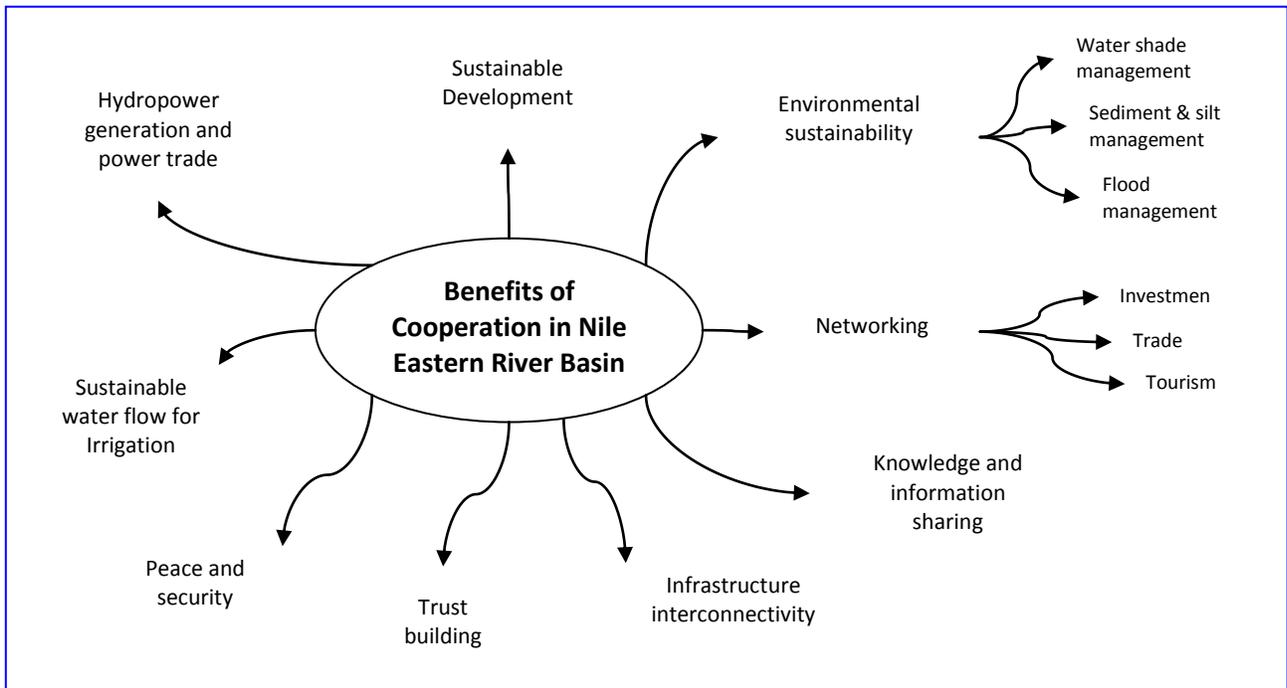
Figure below, shows categories of key Informant Interview (KII) selected for the research.



**Figure 4.1:** Categories of Key Informant groups of the Interview

## 4.2 Benefits of cooperation

The results of the interview analysis presented in Figure 2 below, emerged from both theoretical and key informant interviews, findings on optimizing the benefit of water cooperation on Transboundary Rivers in the Eastern Nile River Basin. Accordingly, the following themes on benefits' sub categories are the dominant cooperation benefits emerged from the majority of the interviewees.



**Figure 4.2:** Emerged Themes on Benefits of Cooperation in the Eastern Nile River basin

The emerged themes of the qualitative data collection and analysis of the study of the benefits of cooperation on the Blue Nile River basin is further described in the following 9 (nine) sections.

### ***BC Theme 1: Environmental sustainability:***

“**Environmental sustainability**” is a predominant category for the majority of the interviewees. The analysis shows different aspects of these benefits including water shade management of the basin, soil conservation, quality control, silt reduction, flood regulation and so on.

Most of the interviewees mentioned that one of the major benefits for the downstream riparian country, Sudan and Egypt, will highly benefit from cooperation in resolving problems related to siltation and flooding problems. During the rainy season (June-August) the flow of the Blue Nile

is very high which causes flooding in the downstream country especially in Sudan. The soil, which is eroded and washed from the Ethiopian highlands, causes a serious damage on irrigation structure and siltation in the dam which decrease the lifetime of the Dam and irrigation structures. Many interviewees mentioned that construction of Dams in the upstream of the Blue Nile Basin (in Ethiopia) will reduce the flood and sedimentation risk in Sudan and Egypt.

“The sediment load that enters to Gezira, they are spending annually about 30 to 50 million USD for di siltation, now it is already taken care of by GERD” (Respondent #8).

“This big Dam and the valleys of the Blue Nile will reduce sediment which is a big problem in Sudan as well as Egypt. In Sudan it causes high maintenance cost of canals and hydraulic structure, Sudan don't have big storage dams so during flood season they open all dams and let the water pass through so this also affect the high Aswan dam. Due to the structure and Dams in Ethiopia the high Aswan dam will be protected from sedimentation” (respondent # 6).

“...The third one is plus the benefit that is sediment retention b/c their main canals are highly affected by sediment and they put a lot of money on that, more than 50 million USD per year to excavate” (respondent # 11)

“If there is a dam and if control 75 billion M3 of water in the reservoir then all the downstream state will get a regulated flow, meaning flooding will be reduced, which Sudan is always vulnerable to flooding that flooding will completely stop.”(Respondent# 10)

“Generally the dams in Ethiopia regulate the flow of Blue Nile; this dam will regulate flow annually and can able to get regulated flow annually. This is beneficial for downstream countries like in Sudan it prevents from flood, since Sudan is highly affected by flood. In 2007 about 300 million us dollar is coasted due to flooding and in 2016 about 140 people died and 1000 of people were displaced and 1000 of houses were destroyed” (Respondent #6).

Interviewees also highlight that cooperation within riparian country is important to protect the Nile itself.

“Cooperation with the riparian country is very important primarily to protect the Nile itself from pollution, miss use of the water resource and protection the whole riparian ecology and environment” ( Respondent #9).

“The most important thing is that cooperation is in the basin not in the country, unless we develop and manage the basin sustainably all countries will loss in the future, due to climate change, due to population growth, and environmental degradation” (Respondent#5)

“Ethiopia has benefited from investment in watershed management, which is a big Environmental trait on the whole basin b/c of degradation of soil from Ethiopia highlands which is also a transboundary issue. The lost fertile soil affects Ethiopian farmers and the eroded soil (Sediment) affects downstream countries.”(Respondent #1)

“Environmental sustainability is one of the most important purposes of cooperation. Unless our Environment is protected and sustainably managed we are leading to serious Environmental degradation” (Respondent # 5)

“The countries may also be benefited environmentally that would decrease the land degradation and improve the biodiversity through integrated watershed management” (respondent #16”)

“If you look at the projects which ENTRO involved, for example, watershed project, which is one of good example of cooperation. If we can reduce the land degradation in Ethiopia the downstream countries are also benefit (Respondent#2)

The interviewee also mentioned that due to cooperation on the Blue Nile there is environmental benefit which is related to climate change.

“There is also an environmental benefit in terms of climate change we are expecting in the order of 10,000million megatons of carbon dioxide equivalent mitigation if we are exporting clean, renewable energy to Sudan and Egypt, so we are replacing coal that has to be also calculated in the form of international cooperation that contribute to climate change mitigation effort” (Respondent # 8)

“Having water reservoir in the upstream is always beneficial for the three countries ,we are saving the evapotranspiration loss, having more reservoir in the blue Nile course is big advantage even in the face of climate change”(Respondent#8)

Interviewee points out the cooperative construction of dams and reservoirs at the upstream of the basin will decrease the loss of water through evaporation and enable the countries to conserve water that can able them to get the sustainable flow of water throughout the year.

“Water will be better conserved b/c of Ethiopian Dam due to less Evaporation and less wastage here in Ethiopia So, the two countries will benefit by cooperating with Ethiopia Specially on the shared water among the three countries” (Respondent #19)

“GERD, which is going to hold quite a huge amount of water could be a water reservoir for Sudan and Egypt b/c the evaporation rate at downstream is very high and Ethiopia is much cooler than Egypt and Sudan the water will be safely conserved for the beneficial use” (Respondent # 9)

***BC Theme 2: Sustainable development:***

“Sustainable development” defined as the development that takes into account the needs of the present generation without compromising future generation. As several interviewees pointed out cooperation has a greater contribution for sustainable utilization of shared water resource which leads to sustainable development of countries and achievement of sustainable development Goals.

“Sustainable development is interconnected to transboundary water cooperation in a way that, transboundary water cooperation could bring to the implementation of sustainable development goals for the mismanagement of water” (Respondent#16)

“Transboundary water cooperation (especially in Nile River Basin) is the centre of gravity in moving forward to attain Sustainable Development Goal” (Respondent#15).

“If there is transboundary cooperation; rivers and wetlands are protected, water-treatment technologies are shared—that leads to accomplishing Sustainable Development Goal” (Respondent # 13)

“Cooperation on the use of water resource is also an important source for sustainable development. Water resource is important in all aspect to combat poverty and achieve sustainable development.” (Respondent #9)

“Water is the bottom line for achieving Sustainable development, so if we improve the water management and if we use rationally we achieve everything” (Respondent #8)

“Water resource mean land resource, power resource and everything, so transboundary cooperation is a catalyst for countries development as a whole” (Respondent # 5)

“Cooperation has greater importance on resource mobilization; if we can able to mobilize enough finance from cooperation we can use it in sustainable development rather than unilateral national financial resource” (Respondent #4)

“If there is cooperation there will be High production of Electricity, More water supply access and sanitation facilities, There will be better peace and security therefore, All developments need water in one way or another, so, cooperation contributes for the achievement of sustainable development of countries.” (Respondent #1)

***BC Theme 3: Hydropower generation and power trade:***

“**Hydropower generation and power trade**” this is a crucial benefit category as well. The analysis shows different aspects of these benefits including hydro power generation or production, hydropower trade and electric power connectivity.

Because of its morphology and physiographies setting Ethiopia is naturally suitable for the generation or production of huge amount of hydroelectric power. In the upstream country Ethiopia, there are conducive environment and very narrow deep gorges that can store billions of cubic meters of water, which is also a big opportunity for the riparian countries in the basin. Many interviewees mention that Ethiopia will generate direct benefit from hydroelectric power generation which can satisfy its domestic demand and also use for generation of foreign currency. The other riparian country will also benefit in the way that they can able to get cheap or affordable hydroelectric power from Ethiopia.

“Rivers of Ethiopia have huge potential for hydropower development so if Ethiopia develops these resources ,Ethiopia will be benefited from foreign currency revenue by selling this surplus power that will help social development of the country as well”(Respondent# 6).

“One thing Ethiopia needs hydro power for its economic growth and also there is a plan to integrate neighbouring country with power” (respondent # 17)

“If they work together on energy generation b/c the riparian countries are energy hungry countries so they could generate energy and distribute energy for beneficial use for their sister countries” (Respondent#19)

“We have also power interconnection b/n Ethiopia and Sudan. It is already in place and now they have planned to connect additional power b/n Ethiopia and Sudan and Ethiopia and South Sudan so these are examples of benefit of cooperation”(Respondent#2)

“Ethiopia is able to sell 100MW of Energy to Sudan for the last 3 to four years” (respondent#1)

“In terms of power even if it is between Ethiopia and Sudan there is power trade study of 3,200MW which is proposed b/n Ethiopia ,Sudan and Egypt in which (1200 MW in Sudan, and 2000 for Egypt)” (Respondent#1).

“They are going to generate very cheap electricity the cost of production per kilowatt hour in Ethiopia is about 4 or 5 cents per kilowatt hour, if we go to Gezira skim they produce with the rate of 14 or 15 cents , high Aswan dam is a about 32 cents per kilowatt hour . Having this kind of cheap electric production will benefit the whole eastern Africa.” (Respondent #8)

“Egypt and Sudan will be benefited more from cooperation by accessing to cheap electricity supplied by upstream states that have high potential of hydropower....” (Respondent # 15)

“Commercially also they could get affordable electricity by interconnection b/c the dam is on the border and they have hydropower in the border that they connect to it” (Respondent# 11)

“Ethiopia and Other countries can benefit from this cooperation in the sense that the hydropower Ethiopia will be generated can be transferred to Sudan and Egypt b/c of Ethiopia’s hydropower much cheaper than it would be produced in Sudan and Egypt” ( Respondent # 19).

“There is also an opportunity of trading power within the region and the hydropower produced in Ethiopia could be exported to Egypt. So power trade will improve regional integration” (Respondent# 6).

***BC Theme 4: Sustainable water flow for Irrigation:***

“**Sustainable water flow for Irrigation**” sustainable water flow and irrigation are closely interconnected benefits that appear together in the interview analysis. The reservoir which is built

on the upstream of the basin will enable the downstream countries have a sustainable and regulated flow throughout the year. Most of the interviewee highlighted that Egypt and Sudan have a large area of irrigated land which can enable them to irrigate their land throughout the year.

“Sudan with its vast land and marginal rain fall most of it is suitable for irrigation. Egypt is also a different metrological setting is suitable for irrigation” (Respondent#2)

“They will get all year round regulated flow of water for irrigation both in Egypt and Sudan” (Respondent#19)

“In terms of flow they will get regulated flow, especially for the Sudanese who have a large irrigation land” (Respondent#17)

“Sudan; is advantageous to get enough water for their potential irrigated land” (Respondent#13)

“After the construction of GERD, Sudan will have a chance to irrigate more land, for Egypt also depending only on Aswan Dam it is greediness b/c the bigger storage is here for Aswan Dam....”(Respondent#12)

“Regulated water would have also an advantage for irrigation b/c the water is controlled and any water that comes to Sudan could be used for irrigation so beyond Sudan and Egypt will also become a beneficiary b/c the water is controlled and any type of problem that can be associated with particularly summer rain fall in Ethiopia which create a very big problem will be reduced”(Respondent#10)

“Sudan has a huge fertile land ,but there is a problem of proper water storage, so dams are a suitable place for storage of water and this regulation of water will help Sudan in agricultural development to irrigate around one million hectare”(Respondent#6)

“The flow, in the case of Tekeze dam, for example, they can able to produce 3 times a year b/c of the regulated flow they have so by the same taken GERD is also going to give that continuous flow throughout the year. In Sudan land is not a problem and in Ethiopia water is not a problem, but irrigation, land is a problem , so it gives a big opportunity for Sudan to exploit its share”(Respondent#8)

“The most important benefit is not only from irrigation per say, but while developing this irrigation the countries start talking to each other and start sharing information about irrigation development and start engaging each other”(Respondent#1)

***BC Theme 5: Peace and Security:***

“**Peace and Security**” cooperation on transboundary water resources has a very big benefit in terms of bringing peace in geopolitical area and each country will be secured from possible conflict .Respondents point out that peace and security enhances development of the riparian country and will reduce unnecessary cost of military action.

“Cooperation b/n countries avoid conflict and produce security in the area. When there is security in area production and economy of countries will increase and every country will specialize in the area which they are best in it. Transboundary water cooperation contributes to security and security is the main factor for development” (respondent#3)

“The first thing that is achieved is peace among countries and confidence building; also there will be interaction among peoples that will lead to positive attitude” (Respondent #4)

“If we are safe in terms of hydro politics, we achieve peace and security of the region, so countries focused on development rather than other issues” (respondent#5)

“Cooperation ensures making use of its resource for its own development and also for having peace and security and stability within the riparian countries” (Respondent#6)

“The greatest benefit that Ethiopia will get from constructing this dam is peace that it builds with the riparian country” (Respondent#12)

“Regional integration and cooperation will enable them to attain water security, good governance, economic development, ecosystem health, peace and political stability in the region” (Respondent#15)

“In peaceful relation countries could have confidence related the shared benefit that gained from the cooperation and might avoid conflicts” (Respondent #16)

“Peace is one ingredient for cooperation Development without peace can't be achieved, so cooperation on water is vital for the development of country” (Respondent#17)

“If we are safe in terms of hydro politics, we achieve peace and security of the region, so countries focused on development rather than other issues” (Respondent#5)

“The geopolitical area will be more peaceful and each country will feel secure from possible conflict and they continue to negotiate their national conflict of interest” (Respondent#19)

***BC Theme 6: Networking:***

“**Networking**” The analysis shows different aspects of these benefits which are generated due to cooperation on transboundary water resources. These benefits include indirect economic benefits which are investment, trade, tourism, job creation, etc. and also integration between the riparian countries.

“There is a possibility of increasing investment b/n Ethiopia and Sudan and in some extent b/n Ethiopia and Egypt since the cooperation start there has Increased tourist flow from Sudan to Ethiopia” (Respondent #1)

“In terms of the subsidiary action program several projects and program have been prepared in the area of irrigation, Power generation, Water shade management, interconnection and trade. All projects are prepared and implemented on the ground” (Respondent #1)

“The benefit of cooperation is also extending to other fields general commerce we can improve general trade b/n countries, in cross boarder treads all they will benefit (Respondent# 2)

“Investment in the Blue Nile will create many indirect benefits for the economy, job creation, tourism, fishery, settlements, roads, infrastructures, social and economic services, trades, value chains (Respondent# 5)

“Socially the Ethio-Sudan relationship there is a continuous flow of people from both sides (Respondent# 8)

“Cooperation on Energy will open door for others like trade, transport as well as border security (Respondent# 9)

“The Nile Cooperation will: Strength the economic relationship among the riparian’s spatially in terms of water trade (virtual water) as so, strength social and political relationships among nations as well as societies (Respondent# 13)

***BC Theme 7: Knowledge and information sharing:***

**“Knowledge and information sharing”** Interviewees mentioned knowledge and information sharing quite often and in different contexts as one of the benefits of cooperation this includes scientific data and information sharing, capacity building, researches, seminars, conferences and so on.

“There is a flood forecasting and early warning system in which the three countries benefited from these activities” (Respondent#1)

“There are several policies in terms of climate, Environment, water resource, which are prepared and implemented. There are tools and knowledge base information created as part of the process” (Respondent#1)

“Until 2010 there were a lot of achievement many projects implemented, knowledge of basin increased, knowledge creation projects implemented. The capacity in the basin increased in terms of implementation” (Respondent# 5)

“If the water resources developed is through cooperation which means, countries will be more friendly more cooperative and they can use their knowledge human resources they can transfer technology b/n themselves, they can share experiences and they can do the best for each country (Respondent#19)

“There is a lot of knowledge, publication and conferences, there are a lot of workshops they have been a lot of negotiation b/n Nile basin countries” (respondent#19)

“There was a very big gap of un symmetry in terms of capacity in the basin through the last 17-18 years. The asymmetry in the basin has been narrowed through training of hundreds of water resource Engineer from each country in the basin” (Respondent#1)

***BC Theme 8 & 9: Infrastructure interconnectivity and “Trust Building:***

**“Infrastructure interconnectivity” and “Trust Building”** are mentioned less frequently by Interviewees, than the other codes in this benefit category.

Few respondents described that infrastructure interconnectivity by road as one of indirect benefit that the riparian countries, especially (Sudan and Ethiopia) got from cooperation.

“Cooperation increased interconnection b/n Ethiopia and Sudan in terms of infrastructure by road” (Respondent#1)

“There is increased flight b/n Addis Ababa and Khartoum after the cooperation” (Respondent#1)

“Investment in the blue Nile will create many indirect benefits for the economy, job creation, tourism, fishery, settlements, roads and infrastructures....” (Respondent# 5)

“One thing Ethiopia needs hydro power for its economic growth and also there is a plan to integrate neighboring county with power, trade, infrastructure, road” (Respondent# 17)

From both political and Economic point of view working together will drive maximum benefit of the countries. On the contrary unilateral action has a negative effect because of lack of consults action between the riparian countries which lead to undesired instance of mistrust and suspicion. Some Interviewees speak about that trust building between the riparian countries as one benefit of cooperation.

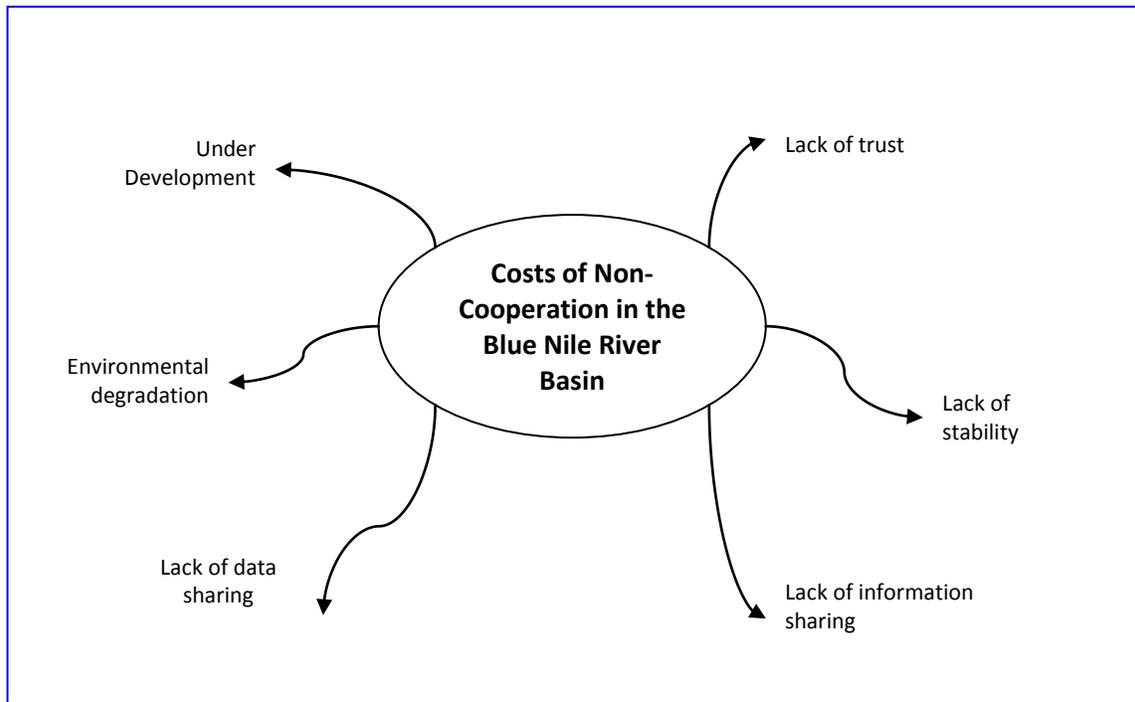
“There is a better confidence b/n country and countries start to discuss openly their issues surround table which has not done previously” (Respondent#1)

“The most important aspect is that through this cooperative process countries start to understand each other’s concern. Countries increase transparency, sharing information and data, increase in understanding what is happening upstream and downstream” (Respondent#1)

“Previous agreement on Nile basin were not all inclusive starting from NBI establishment it becomes all inclusive, all countries come together, start work together, about social, technical, economic, political problem in the basin” (Respondent# 5)

#### **4.3. Costs of Noncooperation**

The following categories described in Figure 3, below, are the dominant factors emerged from data collected on the cost of Non-cooperation themes mentioned in the majority of interviewees.



**Figure 4.3:** Emerged Themes on Costs of Non-Cooperation in the Blue Nile River Basin

***CN Theme 1: Under development:***

“**Under development**” Many Interviewees points out that noncooperation on shared water resource leads to unilateral action by the riparian countries that results underutilization of resources and reduces the maximum benefit that generates from Nile water resource which affects economic social and environmental development of riparian countries.

“If there is no cooperation the countries will not get development at an optimized level” (Respondent#1 }

“The cost of non-cooperation will be sub optimal use of resources” (Respondent#2)

“Unilateral action will lead to the disasters, environmental degradation and the basin will be totally affected, the water resource will be depleted, the water quality will be deteriorated, the total environmental degradation will lead to serious impact for all riparian countries” (Respondent# 5)

“Noncooperation is very costly and as I said earlier, it is a lose-lose. Cost in terms of resources, environmental degradation, cost in terms of economic, social and political aspect” (Respondent # 10)

“Noncooperation reduces the maximum benefit that we get from river” (Respondent# 11)

“If there is noncooperation, poor Ethiopia will continue to flood Sudan and Egypt and Egyptians and Sudanese who are scared of Ethiopia build a dam will keep on or determine to keep the country poor as much as they can. Conflict will keep us poor and we can’t continue like this our population is growing in the millions and that is the cost that we are going to pay b/c of noncooperation” (Respondent # 12)

“Non-cooperation of transboundary rivers results Weak economic and political relationship and Environmental degradation, Social catastrophe including displacement” (Respondent#13)

“Cost of noncooperation would be that always mistrust and suspicion b/n each other and always be non-possibility of thinking bigger and collectively utilizing the resource in the manner that serve the best interest of all riparian countries. Always one country will be developed at the expense of the other simply b/c they don’t have any mechanism that insure the collective utilization of resource so noncooperation has its consequences and serious costs both in the upstream and downstream countries” (respondent# 14)

“The cost of non-cooperation is obviously visible in Nile Basin countries. Poverty, endless political instability” (Respondent#15)

“Lack of cooperation puts the countries to lag behind” (respondent #19)

***CN Theme 2: Lack of trust and stability:***

**“Lack of trust and stability”** Most interviewees who talk about the costs of noncooperation mentioned instability as the tension and conflicts arise due to non- consulted actions by riparian country on shared water resources. They point out that unilateral action on shared water resource causes suspension between riparian country which lead to lack of trust and this lack of trust will result tension, conflict and political instability between riparian countries and also deter development of countries.

“Whenever there is uncoordinated development there will be tension and conflict between countries” (Respondent#1)

“If countries are forced into working independently of each other that will lead to unilateral and unilateral has negative effect that will lead to undesired instance of mistrust and suspicion so, the cost of noncooperation would be that always mistrust and suspicion b/n each other and always be non-possibility of thinking bigger...” (Respondent# 14)

“Noncooperation is costly and each country goes its own way and which will be unnecessary competition, unnecessary conflict and waste of time and unnecessary obstruction for development. There are a number of other cost also cost of suspicion, cost of insecurity so noncooperation is really costly and it is not the best advantage of any country” (Respondent#19)

“If the tension rise in the blue Nile region, it is a very serious problem for all of the countries the countries will be deteriorated, internal affairs of all countries will be affected by external involvement of another country, diplomatic, social, economic relation b/n countries will be, deteriorated, export b/n countries, business b/n the countries, communication b/ n countries will be deteriorated” (Respondent #5)

“If there is no cooperation first, politically there will be high tension, there will be some inconveniences that will deter other development opportunities” (Respondent# 8)

“I don’t expect a war will begin b/c of lack of cooperation there will be foxy war, foxy instability could emerge here and there” (Respondent#8)

***CN Theme 3: Environmental degradation:***

“**Environmental degradation**” is one of the costs of noncooperation which is mentioned by respondents. Most of the Interviewee described that unilateral action of riparian country cause environmental degradation in terms of quality, quantity of resources

“If each and every water using sectors are running to fulfill their own demand, without considering and communicating with others (transboundary river sharing states), this fixed resource will be exposed for over exploitation and degradation of its quality and quantity this will result in running out of water flowing in the river or lakes, resulted in access to polluted or

deteriorated quality water, as a result of upstream uses, which leads to conflict and instability” (Respondent # 15)

“The most important thing is that cooperation is in the basin not in the country, unless we develop and manage the basin sustainably all countries will loss in the future, due to climate change, due to population growth, and environmental degradation” (Respondent# 5)

“The cost of the environment is also Sevier due to noncooperation” (Respondent # 12)

“Environmental degradation could be mentioned among a bunch of problems” (Respondent # 15)

“Cost of noncooperation includes Weak economic and political relationship and Environmental degradation.....” (Respondent # 13)

“If there is noncooperation, poor Ethiopia will continue to flood Sudan and Egypt” (Respondent # 12)

***CN Theme 4: Lack of data and information sharing:***

**“Lack of data and information sharing”** Few respondents described a lack of data and information sharing b/n riparian countries as one of the costs of noncooperation. Interviewee mentioned that whenever there is unilateral action on shared water resource there is a problem to access or share data between countries, exchange information and consulted action on a shared water resource which hinders the maximum benefit that the riparian country generate from shared resources.

“If there is no cooperation the countries will not exchange information about their development. The activities which are done upstream will affect downstream” (Respondent#1)

“High Aswan Dam, Egyptian constructed such a large Dam without consultation with other riparian country and it was very expensive at a time and a lot of water evaporate, but if there were cooperation b/n Egypt, Sudan and Ethiopia 60 years ago we could build together GERD from that what we get is 7 billion cubic meters of water in the system so this is a lost now basically” (Respondent# 11)

“Noncooperation encourages a unilateral approach for water development which means without understanding which country needs what and countries best to do what on shared water resources” (respondent# 19)

#### 4.4. Observed challenges of cooperation in the basin

The following categories described in Figure 4, below, are the dominant factors emerged from data collected on the Observed challenges of cooperation in the basin themes mentioned in the majority of interviewees.

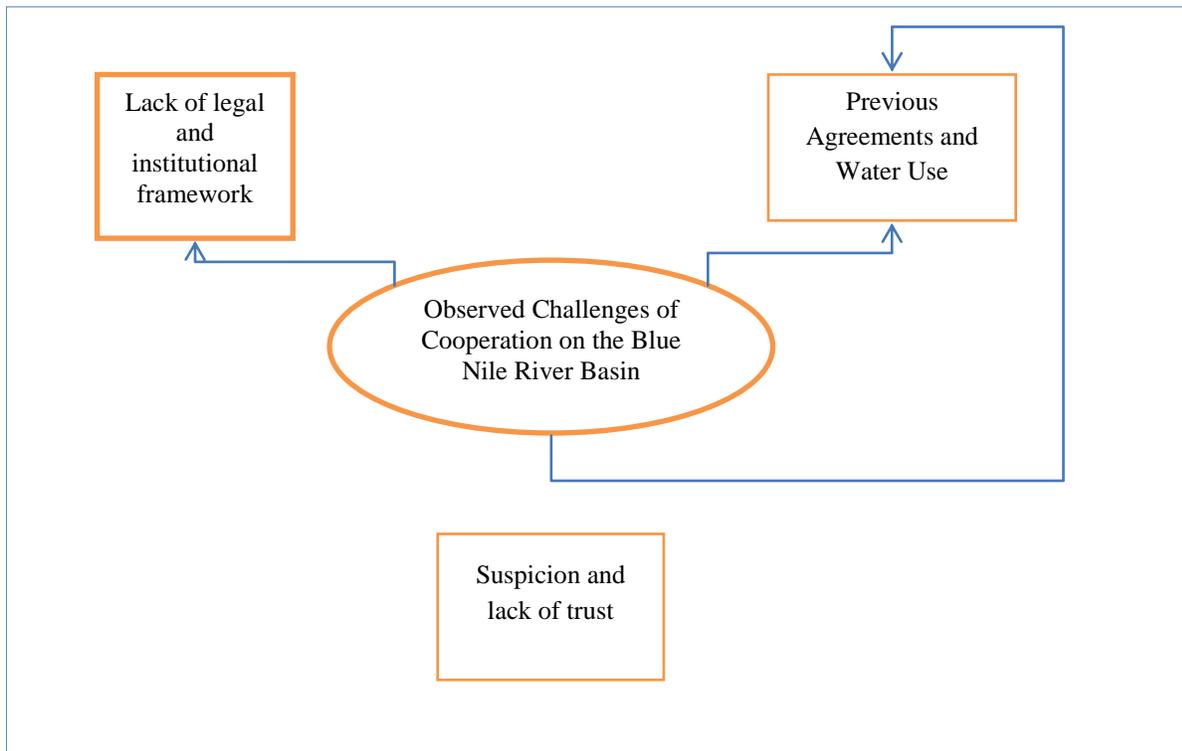


Figure 4.4 Emerged Themes on Observed challenges in the Blue Nile River Basin

##### **OCC Theme 1: Previous agreement and Water Use:**

“**Previous agreement and Water Use**” Many interviewees mentioned that one of the main challenges in the basin is the previous agreement, both colonial and post-colonial agreements which ignored the interests and right of upstream riparian countries and the unfair or imbalanced water allocation and water use by downstream countries.

“The main challenge is that some countries are still promoting they are the only users of the resource and earlier agreement should accept by each country” (Respondent #4)

“A lot of problems have been observed; As we know Nile is a shared water resource and it don't belong to one country, but the challenges is there is no level ground or stethoscope that is, some are benefited from resource and some are not and those who are benefiting from the resource want to continue with that stethoscope which is unfair” (Respondent # 6)

“Egypt wants to stick to the previous agreement and the last agreement doesn't consider Ethiopia” (respondent # 7)

“The big challenge is the hegemony because Egypt has already put on it every constitution, they said Egypt is the Nile and Nile is Egypt. And most of Egyptian can do understand that the water starts from the high Aswan Dam, they consider it their own property that is the major obstacle in the negotiation even in the tripartite and Nile basin initiatives. In Egypt a lot of water is lost because of misuse and abuse of water they are growing rice, which is totally not allowed in that desert environment” (Respondent # 8)

“Nile is very peculiar river water is not abundant, at the same time all the water is used by Sudan and Egypt Consumptively so they don't want the upstream country to reduce the water and they struggle to keep that position, and they want to continue in the previous trend” (Respondent# 11)

“Egypt wants the existing water use and it should be acknowledged by each country which mean they use the whole water, even they may not talk about previous agreement b/c in the agreement they get 55.5 billion m<sup>3</sup> and plus evaporation 65 billion but currently they are using about 73 billion and more” (Respondent #11)

“Second reason I might say a problem for Egypt is the traditional beliefs that Egyptians from the Pharaoh onward keep on telling them Nile is their own Property and no one has a right to touch it” (Respondent#12)

“First and for most Egypt has withdrawn from NBI b/c they don't want other countries to come and cooperate on an equal footing and other countries have been approaching to cooperation on the basis of avoiding stethoscope which established the monopoly of water use and water right for Egypt specially to some extent to Sudan” (Respondent # 19)

“Egypt mainly and Sudan also wants to maintain their status quo this is one of the worst things to experience in the Nile basin after negotiating for 11 years that Egypt and Sudan will not accept this agreement” (Respondent#19)

**OCC Theme 2: Lack of legal and institutional framework:**

The Nile basin countries have been working on the framework of NBI since 1998 in the transition mechanism. Many interviewee points out that, the absence of changing this transitional mechanism into a permanent institution and legal platform, which requires a serious negotiation and political commitment between riparian countries is one of the main challenges observed in the basin. Interviewees also highlighted that due to lack of cooperation framework agreement (CFA) between the riparian countries sometimes they are opting to go for bilateral or trilateral agreement.

“Countries sometimes opt to go for bilateral and trilateral arrangements while the NBI serving at basin level and some developments is considered as countries are not interested at the basin level” (respondent# 1)

“The observed challenge is; Egypt is frozen participation, there were supposed to be a commission NBI is transition it was meant to end up with a commission and they prepare framework but Egypt was not agreed “(Respondent # 3)

“Legal framework didn’t rectified by 6 countries; the permanent CFA is not in placed and freezing of participation of Egypt are the challenges” (Respondent#5)

“The delay of agreement signing is one of the problems that has to be solved as quickly as possible” (Respondent#7)

“If there is willing to cooperate b/n countries, it will not be difficult to have a legal framework the problem is willingness by country, for example b/c Egypt is not willing the CFA is not signed yet and this Cause a big problem for the projects implement on Nile in terms of finance b/c donors are not willing to spend the money” (respondent#12)

“If the country have willing to work on the framework of that particular legislation, then of course there will be issues, but they will resolve in a peaceful way when we have legal institution

and framework. When we don't have anything at all we are always in a deep hole” (Respondent#14)

“Egypt and Sudan don't want to sign the CFA b/c they want the CFA to provide Stethoscope that right of water ownership to be maintained as 1950 agreement which totally provides the entire amount of the water mostly to Egypt and Sudan So, this was not accepted by other countries” (respondent #19)

### **OCC Theme 3: Suspicion and lack of Trust:**

Few respondents mention that lack of trust and suspicion between countries, especially on the development activities which are performed by one country are the challenges which are observed in the basin.

“One of the observed Challenge is mistrust b/n Upstream and downstream country, this mistrust arises from what if they didn't let the water flow, what if they kept all the water, Mistrust on technical failures for example during construction and design” (Respondent# 12)

“Challenges are usually associated with the perceived or real traits like Egyptian saying that building the dam will create consequences and they don't have confidence” (Respondent# 10)

“NBI, which is peacefully executed, but when it comes to Egypt, they are frightened they think this cooperation, reduce the flow of the Nile to Egypt” (Respondent #9)

“In transboundary water resource management there is always suspicion, lack of confidence and fear of unknowns”(Respondent #1)

### **4.5. Interviewees Recommendations to improve communication, networking and cooperation**

The following categories described in Figure 5, below, are the dominant factors emerged from data collected on the Recommendations to improve Communication, networking and cooperation between the riparian country themes mentioned in the majority of interviewees.

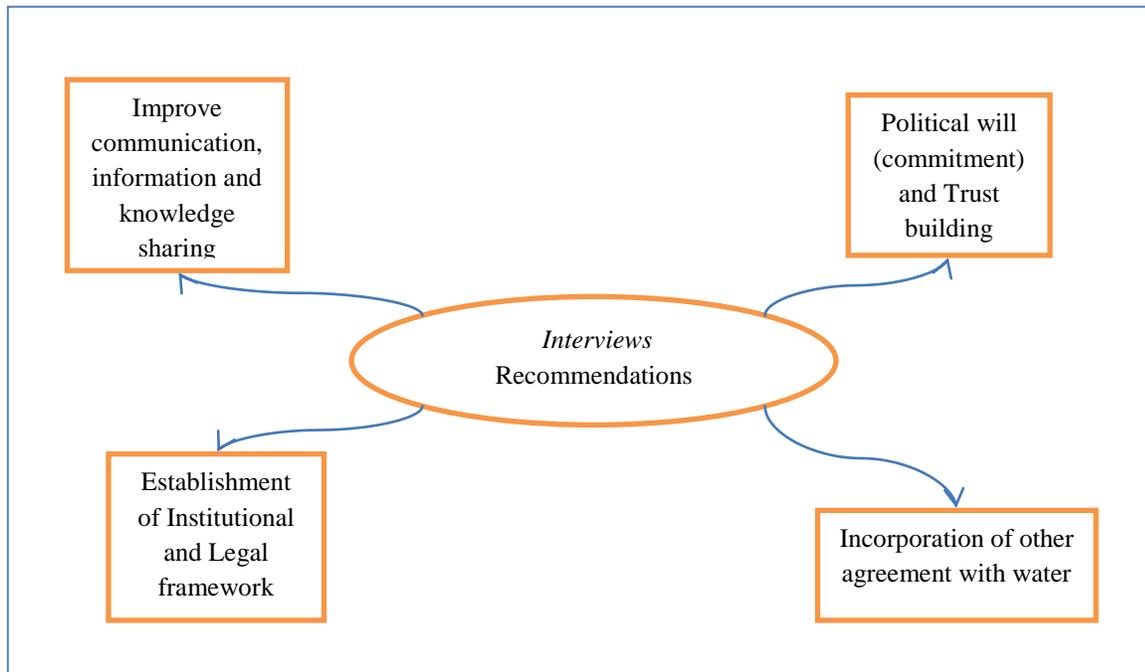


Figure 4.5: Emerged Themes on the Recommendations to improve communication, networking and cooperation between the riparian countries in the Blue Nile River Basin.

**RC Theme1: Improve communication, information and knowledge sharing:**

Improving communication, information and knowledge sharing between the riparian countries is one of the recommendations mentioned by interviewees. Many interviewees point out that information about the maximum benefit that are going to achieve through cooperation should be identified through research and shared through conferences, publications, workshops, and so on. The respondents highlighted that media should play a major role to disseminate the right information on the benefits of cooperation to the society. There should be full transparency on scientific data sharing between all riparian countries, the riparian country should work together and think as one river basin unit. The respondent also mentioned capacity building on water resource management should be improved between the riparian countries.

“There should be an exchange of information and data between the countries and there should be understanding of demand and concerns” (Respondent#1)

“ There is a history of hydro political issues b/n eastern Nile countries, downstream and upstream, we need to improve the trust, we need to convince people at the grass root level to understand the benefit of cooperation and risk in non cooperation”( Respondent#2)

“We have to work on media; media’s role actually in my opinion is not so far helping in promoting cooperation. So we need to work with the media to remove the miss conception and deliver the right understanding” (Respondent#2)

“If people do not have positive perspective, knowledge and understanding about the role of that institution and legal framework at the end of the day we don’t achieve the success and people always be suspicious” (Respondent #14)

“This period is a time of Science and Science can solve problems so if the professional among this riparian countries work together on scientific base then cooperation can be realized” (Respondent #4)

“Improve communication, working together and managing the basin together, we have to be frank and transparent our intention has to be clear, it has to be focused towards the basin problem not to other politics and differences” (Respondent# 5)

“We have to be specific and at the same time our communication and involvement has to be all inclusive, work together, our main agenda should be to save the basin, we should not mix or intermingle our broader problem with the basin. We have to learn to work on a joint multipurpose project plan and working together; improve our understanding of our basin” (Respondent #5)

“Countries need to continue to have dialogue to have more understanding of each other’s need and concerns” (respondent#6)

“Egypt is more experienced in capacity building and they know about water resource management by far, so there should be capacity building b/n countries and sharing of knowledge” (Respondent # 7)

“I think it is the time to strategically and critically think and think as one hydrological unit rather than bounding ourselves with political boundaries. There is also a need for water resource knowledge. In Ethiopia water education was not there, it is not more than 3 decays; since the

water institute started before that it is not in the curriculum, so they have to cooperate in knowledge and capacity building.” (Respondent# 12)

“Conducting scientific research to reach an agreement among the nations related to water usage and allocation, which should have done based on scientific studies and by neutral organizations such as GWP, UN-Water etc.” (Respondent# 13)

“My recommendation is negotiations should be on scientific finding not only diplomatic acts, so the thing which have to come first on cooperation is knowledge In transboundary resource cooperation things should start from the ground scientific findings.” (Respondent#17)

### **RC Theme 2: political will (commitment) and Trust Building:**

Most of the interviewees mentioned that trust should be built b/n riparian countries to achieve maximum benefit from shared resource and sustainable growth through cooperative resource development. Respondents also highlighted that Nile Basin countries should initially build trust and trusting each is to sit together and negotiate in terms and conditions. International law has its own limitation that most of the principles are not clear cut, but riparian countries should have to trust in the system of international law. Interviewees point out that the countries should be willing to invest politically and to be committed.

“For this cooperation to go ahead there should be sufficient confidence and trust b/n countries” (respondent#1)

“There should be all inclusive system where all countries discuss its question, raise its reservations, concerns and voice together” (Respondent#5)

“We have to work together not for the benefit of one country but for the benefit of all countries, we have to have shared benefit from the system” (Respondent# 5)

“Ethiopia should work on trust building, diplomacy with the riparian country” (Respondent#7)

“Researchers, hydro politicians should really work hard together and come up with a win win solution, but there must be political will first of all if there is no political will, researchers alone cannot do anything. The Scientists and the politicians should really sing the same song; they have

to be on the same line about water allocation, about the use of water, water use efficiency and interconnectedness of all system” (Respondent #8)

“The first thing what we have to do is the tripartite meeting that is going on currently instead of focusing on once interest to maximize the expense of other riparian state it is always better to think basin wide” (Respondent# 10)

“First the willingness to collaborate have to be there avoiding any kind of mistrust otherwise water may not flow in the Nile” (Respondent #12)

“The first thing is trust and you have to have also faith in the system of international law, if countries quite willy to invest in diplomacy and also engage in faiths and with a certain level of trust b/n countries, then there is no predicate that they cannot go through serious investment in terms of diplomacy, in terms of trusting each other motives in all those negotiations and some trust on the system of international law. Trust building, Institutional framework and knowledge and information sharing have to come side by side b/c there is no way to establish an institution without first building the trust” (Respondent#14)

“In the Nile basin there is a huge amount of resource and cooperation in that regard is very important in terms of how you want to utilize the water resource in very effective and efficient environmental friendly manner requires serious thinking and serious political commitment” (Respondent#14)

### **RC Theme 3: Establishment of Institutional and Legal Framework:**

Most of the interviewees point out that there should be a permanent institution that handle all issues related to development request by riparian countries and also there should be an institution that should impact positively the life of riparian communities. In addition the respondent highlighted that there should be framed legal system or agreement with the established institution which will govern all the riparian countries.

“There should be all inclusive legal frameworks that can put an obligation on each country and provide their rights. There should be permanent institutional arrangements that can manage the water resource that will have a compatible policy standard approach” (Respondent#1)

“All countries should work together and come to one legal framework in the basin; unless we have this institutional and legal framework in the basin we can’t manage properly the system” (Respondent#5)

“CFA is a very important framework if the institution has such framework; it governs the water utilization in the basin. Having such framework agreement is basic that govern all riparian countries” (Respondent # 10)

“For Nile the basic thing is to have ratified CFA by all countries make water allocation agreements, then build cooperation on that before having water allocation agreement in my opinion talking about benefit sharing is very difficult” (Respondent#11)

“There should be Peaceful agreement on water management, usage and allocation among nations” (Respondent # 13)

“If the country have willing to work on the framework of that particular legislation, then of course there will be issues, but they will resolve in a peaceful way when we have legal institution and framework. So any institutional and legal framework would be established in the Nile basin will be confronting a different set of challenges than those challenges which you would see elsewhere in another part” (Respondent #14)

“There should be an efficient and equitable utilization of basin water resources which helps to promote cooperation among the riparian states of Nile basin countries” (Respondent #16)

“First, we have to have a strong institution, then the others derived from it, and we will be cooperating well” (Respondent# 18)

“.....Nile cannot copy from another country, but Nile can learn from other countries. From them we learn to cooperate on quality, equitable utilization and establishing a commission for basin” (Respondent#19)

**RC Theme 4: Incorporation of other development cooperation agreement with water:**

Few respondents mentioned that having another developmental agreement in addition to the water resource agreement with riparian country will help to create a strong bond between

countries and make it is easier to reach on agreements than only to negotiate on water which is scared and competitive natural resource.

“Cooperation is not only on water and water is not the only thing b/n them there are also other things which are existing and need to be created so they can expand areas of cooperation b/n two countries or b/n all Nile basin countries again it is an option they have to use creatively mutual understanding on the area of cooperation” (Respondent#19)

“.....Establish agreement for the sustainable use of water through trade of products and electricity. Establish cooperation through multipurpose uses of water through climate resilient growth and regional integration” (Respondent #16)

“Going with many packages is also another good way of having stronger cooperation b/n countries; it is like making other developmental cooperation b/n countries and adds water as one element” (Respondent#11)

“NBI should add another dimension of cooperation on top of water resource which help countries to cooperate on water b/c they are also cooperating on another dimension by all countries” (Respondent#1)

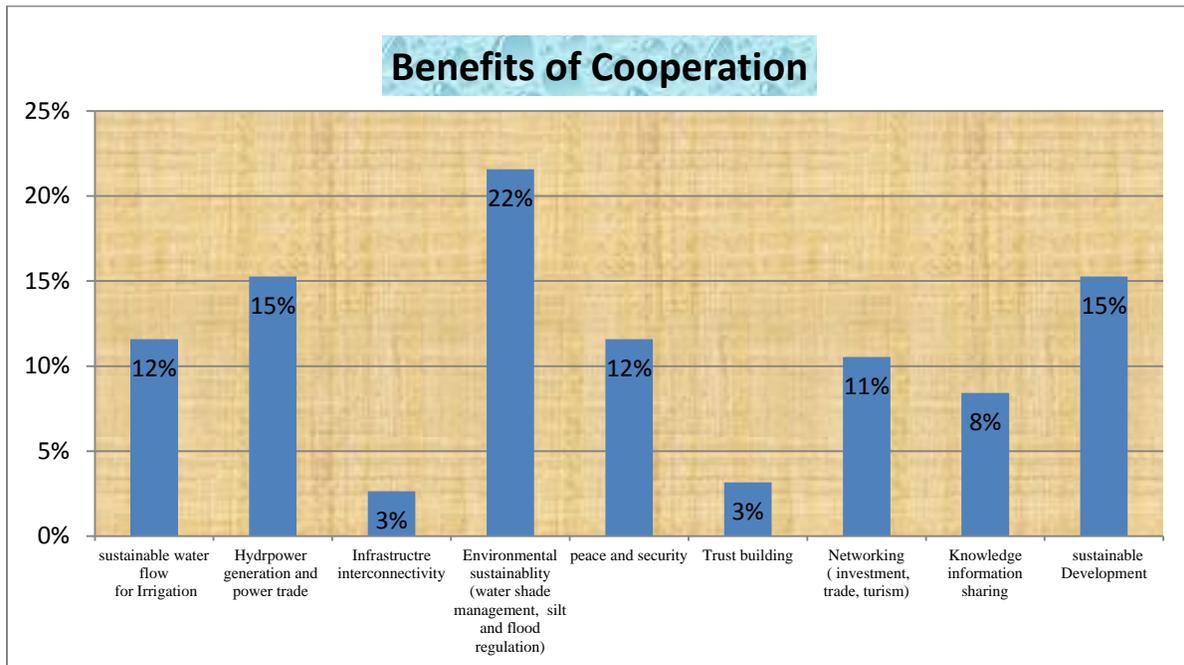
## Chapter V Analysis and Discussion

### 5.1. Introduction

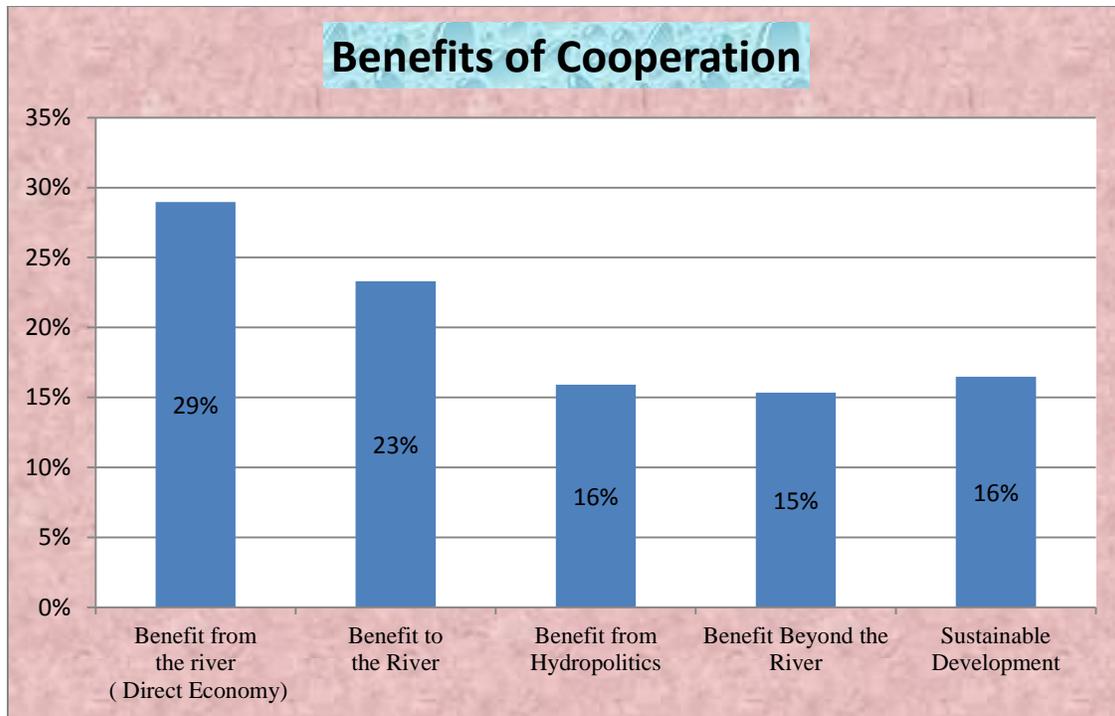
The application of Benefit sharing in the context of transboundary basin is presented in the chapter two (literature review part of this research). This benefit includes; Environmental Benefit, Direct economic Benefit, Indirect economic benefit and political benefit (Hydro politics). These benefits can be realized through four types of cooperation, unilateral action, coordination, collaboration and joint action (Sadoff CW and Grey D, 2002). This research is focused on optimizing benefit of cooperation on the Blue Nile River Basin. Based on the literature review a number of benefits of cooperation on the Blue Nile basin identified. The research findings also confirmed that there are a lot of benefits immersed from cooperation on the transboundy Blue Nile River and there are a lot of costs due to noncooperation on the water resource development and management. This Chapter provides analysis and discussion of main findings from the research and links the literature to the research outcome.

### 5.2. Benefits of Cooperation on transboundary Blue Nile River

The general Research Objective investigated that the benefits that are generated from cooperative transboundary water resource utilization and management.



**Figure 5.1:** Benefits of cooperation on Blue Nile River Basin



**Figure 5.2** The four types of benefit from the River

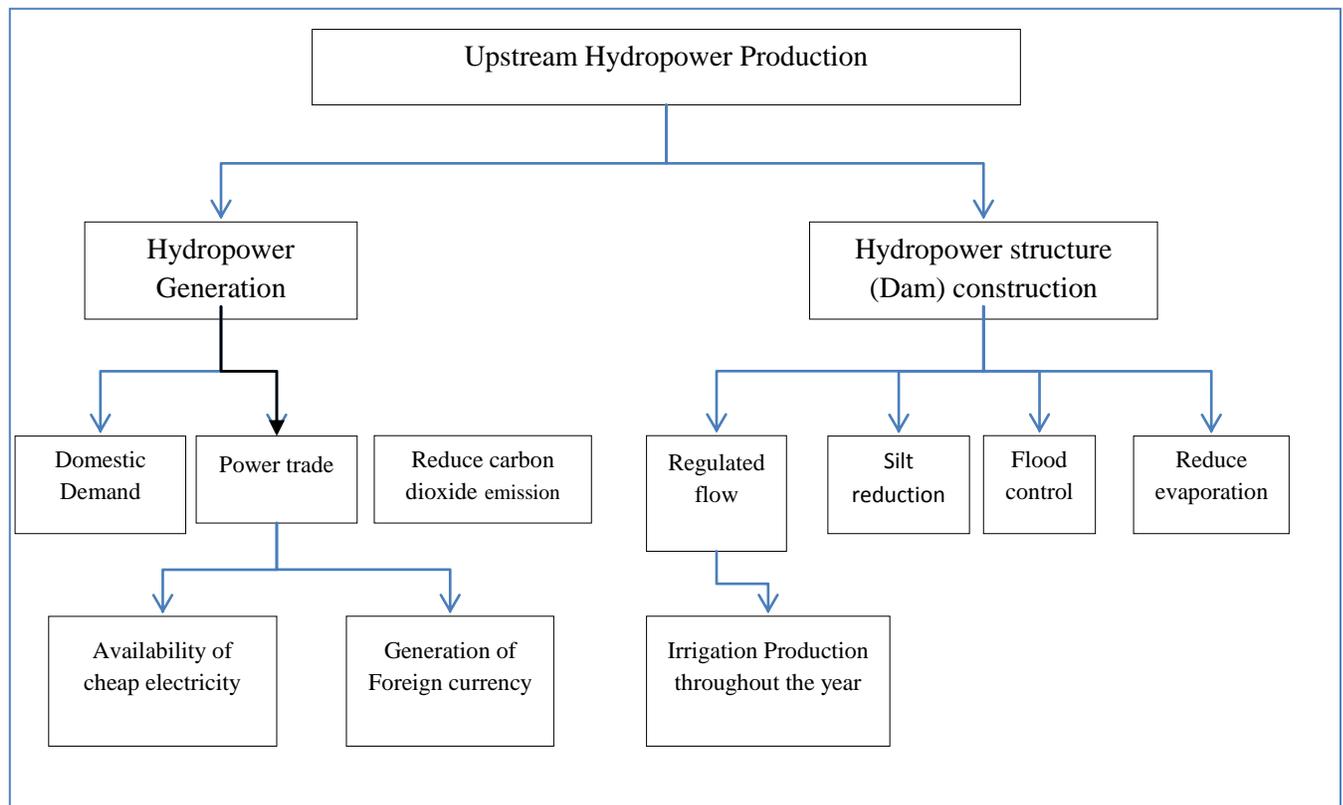
The interview analysis shows that there are quite a number of benefits generated from the integrated action on the management and utilization of the water resource in the Blue Nile basin. 22% of the respondent during the interview mentioned that cooperation in transboundary water resource management has a greater benefit on Environment.

Dams, which are constructed on the upstream of the basin and the environmental conservation activities which are performed on the upstream of the river basin have a greater advantage for the conservation of the environment, mainly in terms of protecting soil erosion from Ethiopian Highlands, avoiding flooding hazards during rainy seasons and reduces siltation problem on hydraulic structures on downstream countries especially in Sudan and Egypt. Most of the Literatures also support this view:

As the trend analysis studies in regional per capita water availability in Africa over the past half century indicated, water availability has declined by 75% (IPCC 2001). The IPCC (2007) has projected that by 2020 between 75 and 250 million people in Africa will be exposed to an increase in water stress due to land degradation and climate change. This indicates that a collaboration management has to be implemented at the watershed and river basin scale in the

upstream regions of the Nile basin (Asmamaw, 2015). Ethiopian highlands have been experiencing declining soil fertility and severe soil erosion due to intensive farming on steep and fragile lands and other factors attributed to population pressure (Birhanu & Meseret, 2013). The annual economic cost of watershed degradation in Ethiopia is estimated at USD 670 million per annum (2012), with up to 200 million metric tons of fertile topsoil being washed away every year (ENTRO, 2012). Soil erosion is the major threat in the Ethiopian highlands that increased sedimentation of reservoirs and lakes (Awulachew et al. 2007, Alemu and Kidane 2014) cited on (Asmamaw, 2015). Therefore, soil erosion control is the most important land management strategy in the Ethiopian highlands. A significant opportunity for transboundary benefits from watershed management is erosion control and sediment management. These sediments translate to significant costs downstream in Sudan and Egypt, including hydro power under performance, high maintenance costs of hydropower infrastructure, dredging costs of infrastructure, maintenance costs of clogged irrigation canals, etc. During exceptionally wet years, high discharge from the Blue Nile, Atbara and the Sobat River results in large-scale flooding in the floodplain areas of southeastern Sudan. These events have led to damage of irrigation infrastructure and the spread of waterborne diseases (Asmamaw, 2015). According to the NBI's State of the River Nile Basin (2012), the storage capacity of the Roseires and Khasm el Girba reservoirs has fallen by 60% and 40% respectively over the last 30 years. As a huge amount of water (71%) comes from Blue Nile and Atbara Rivers, in situ water and sediment management in the Abbay and Tekeze basins is very essential (Negusse, T., Yazew, E., and Tadesse, N, 2013). Studies that applied different models to anticipate the impact of the project on downstream countries suggest that Sudan will potentially gain more benefits from the Great Ethiopian Renaissance Dam (GERD). It is expected that the GERD would reduce sedimentation and, thus, improve the operation of Sudanese dams (IPoE, 2013; Kahsay et al., 2015) cited on (Rawia, 2016). In terms of climate change mitigation the construction of Dams for hydro power production in Ethiopia enables to export clean energy and minimize environmental impact. Environmentally, Ethiopia's gradual dependence on hydropower would reduce the environmental and health impacts of biomass fuel used by most of its population (Rawia, 2016). Additionally, the regulation of water flow and coordination of upstream storage with downstream reservoirs could potentially mitigate future drought conditions and the consequence of climate change, increasing downstream water security.

Direct economic benefit is one of the four types of benefit generated from cooperation on transboundary water resource. This benefit is derived from the use of water in a river system. The research analysis on the above (figure 5.2) shows that the riparian countries will generate 29% of direct economic benefit from cooperation on the Blue Nile River. Hydro power generation which is a non-consumptive use of water in the system is one of the major direct economic benefits that can be achieved from cooperation on the Blue Nile River basin. The interview finding in the previous chapter shows that upstream part of the Blue Nile River is suitable for huge hydroelectric power generations. And also from the above analysis in (figure 5.1) 15% of benefit in the basin is from hydropower generation and power trade. The hydroelectric power generation enables Ethiopia to meet its domestic power demand and enable to generate foreign currency. Other riparian country (Sudan and Egypt) will also benefit from the availability of cheap electricity through power connection with Ethiopia. Using hydropower as a source of energy has a greater importance in terms of environmental protection and climate change mitigation as it reduces carbon dioxide emissions by replacing fossil fuels alternative. Dams built for Hydropower installation can offer a lot of benefits in terms of River flow regulation which reduces flood, which reduces infrastructure damage, property damage and crop damage, hydropower structures also reduce sedimentation of downstream hydraulic structures, thereby increasing their effective storage and useful life. Building dams upstream along Ethiopia's Blue Nile where rocky mountain soils and narrow gorges would reduce seepage and evaporation by 50% would have increased the available water by an estimated 6 billion cubic meters or more. And the water stored in Ethiopia could also have been used to generate three times more hydropower than produced by the Aswan Dam (Maurice & L. Alan, 2002). The chart below illustrates the benefit that can be generated from hydropower production in the upstream of the river basin and also the different types of benefits emerged from the dam built for hydropower generation.



**Figure 5.3** Types of Benefit emerged from hydropower Dam

There is huge hydro power development potential in the Eastern Nile Basin (Waterbury.J, 2002). The greatest development potential, about 58% of the total in the Nile Basin is located in Ethiopia; this is because of the great differences in altitude. There are a number of water resource development projects in Ethiopia specifically in the Abbay River Basin. The projects are at different stage of development, some are in operational stage, some are under construction and the other is in the studying and design phases (Asegdew, Semu, & Mamru, 2018). According to the master plan study of the Abbay river basin the total potential for hydropower generation in the basin is about 13,000 MW (Ministry of Water Resource, 1999). A Study by (Asegdew, Semu, & Mamru, 2018) show that at the basin scale, the annual production of hydroelectricity is boosted by at least 34,644 GWh/yr amongst which 3,130 GWh/yr is from Sudanese reservoir due to the regulatory capacity of Ethiopian reservoirs. During the full operation phase, Eastern Nile energy will increase at least by 120% and it will reach up to 258% increments. If each reservoir is considered energy productions in Sudan will increase due to the upper cascades, but in the High Aswan Dam (HAD) energy production will slightly decrease because of head reduction. The

study highlighted that the energy production in Sudan will increase by 39% due to the construction of a single reservoir in the Abbay River. There could be small energy reduction (up to 9%) at HAD due to reduced reservoir water level. (ENTRO, 2017) analyzed the feasibility of different development states based on their potential environmental, economic and social impact by comparing the water requirements of each state with basin water resources. The study shows that Hydropower can be developed at all potential sites without having a major impact on the availability of water downstream. In this scenario the study finding shows that inflow to the high Aswan Dam (HAD) are reduced further (Due to evaporation loss in the new reservoirs) but there is no impact on flow into the downstream Delta or the Mediterranean Sea –as the excess storage in the HAD allows releases as before. In terms of return from the total investment in each state about 68.6Billion US dollar Net Present Value of revenue generated from Hydropower (NPV-HP) will be made from the development state of improved situation, which is defined according to the study as the state represents realistic improvement over the current situations, which the most advanced hydropower projects under implementation (i.e., Great Ethiopian Renaissance Dam(GERD) and the upper Atbara scheme) and the assumption that a majority of low performing existing scheme are rehabilitated plus full development of all potential hydropower projects identified in the Eastern Nile basin, but no further irrigation is included. Development States with increased hydropower, yield greater return than those with increased irrigation, although investments in both increase the NPV over the current or even improved situation. The Multi sector investment opportunity analysis (MSIOA, 2017) study concludes that regionally planned hydro power development has minimal impact on regional water resources once the dams are filled. The study also established that, being non-consumptive water use, new hydropower can be managed in a transboundary context while working to reduce evaporative loss from reservoirs, and coordinating filling and operation. And countries need to put in place the condition necessary to realize the potential of generatig hydropower, facilitate power trade and expand transmission at regional level.

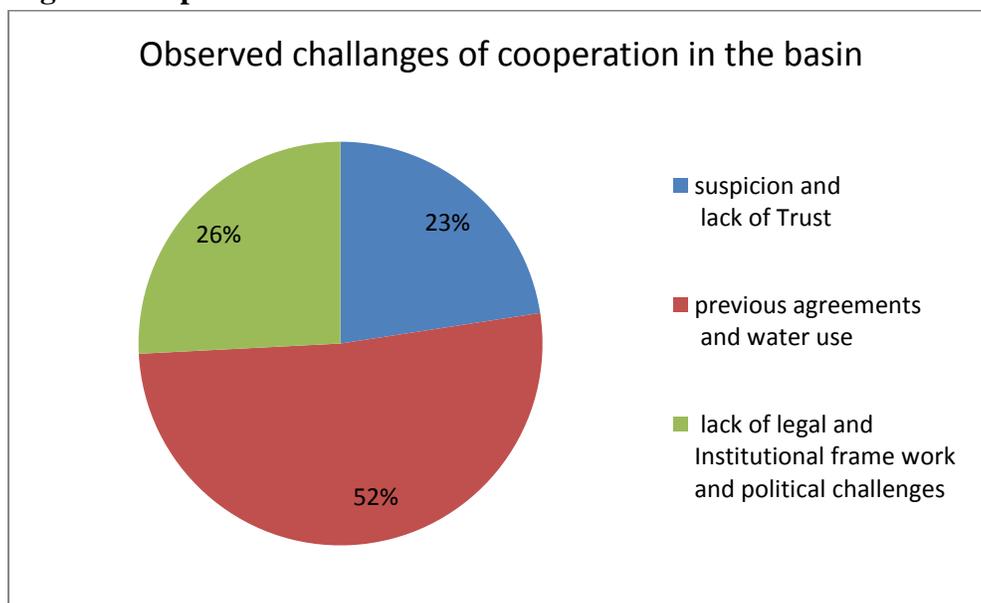
The interview analysis of the research study also shows that 12% of the benefit is obtained from irrigation due to the cooperative water management and development activities performed on the upper Blue Nile river basin. The availability of Regulated water flow throughout the year enables the downstream countries (Sudan and Egypt) to use their large irrigation land for crop production. And there will be a reduction of risk due to hydrological variability with sequences of

dry and wet years. Irrigated agriculture in Sudan will benefit from upstream storage in Ethiopia since the Sudanese annual withdrawals are lower in all scenarios. Those allocation decisions illustrate that once water has passed through the Ethiopian hydropower plants, irrigated agriculture starts competing with hydropower generation and irrigation withdrawals become more economically sound. The regulation capacity of the reservoirs located in Ethiopia would increase irrigation water availability in Sudan. No significant impacts are observed in Egypt (Asegdew, Semu, & Mamru, 2018). Indeed, at the present time, excessive water may be spilled during wet periods at downstream reservoirs because existing reservoirs are already filled and, as a result, water demand failure can occur during a dry period. With GERD, the total storage capacity along the Nile River will significantly increase in the long term. It was noted that water losses from evaporation at the HAD will be reduced, and thus irrigation water supply in Egypt will increase in the dam's operation phase (Mulat & Moges, 2014). Basin Water Management will be easier to optimize with higher storage capacity and upstream regulation capacities. The study on (ENTRO, 2017) shows that un-checked or unilateral expansion of planned irrigation will lead to major water storage or/and abandonment of some irrigation schemes. There is scope for new irrigation, but in the long term, there is not enough water to fulfil the development plan of all countries. Very few combinations of planned national level hydropower and irrigation expansions are feasible at a basin level.

Benefits from hydro politics is another type of benefit generated from cooperation on transboundary water resource. Most of the respondents in the interview also mentioned that Peace and security of the region and trust among the riparian countries are the major benefit which can be obtained from working together on shared water resources in the basin. The study analysis result in (Figure 7.2) shows that 16% of the benefit of the river derived from hydro politics (Peace and security and trust building among the basin countries). The 'soft/intangible' benefits are difficult to measure, but they can be evaluated against the increase in the level of trust and cooperation, enhanced regional peace and security, the reduction of potential conflict, continuing and sustainable riparian collaboration, and greater emphasis on regional projects and enhanced risk mitigation. The literatures below also strengthen this idea of soft /intangible benefit in the basin.

With the objective of making poverty history, Ethiopia’s developmental plans prioritized hydropower projects as drivers for development and regional integration. The Ethiopian–Sudanese rapprochement and convergence of positions on the GERD help achieve ‘regional integration through the generation of sustainable and clean energy supply’ vision and represent a turning point in hydro-political relations in the Nile basin (Rawia, 2016). Following the signing of the DoP, Egypt tried to catch up with Ethiopia and Sudan’s integration endeavours. Egyptian President Abdel Fattah El-Sisi paid a state visit to Ethiopia during which he agreed with Ethiopian Prime Minister Hailemariam Desalegn to elevate the bilateral ministerial commission to the presidential level to enhance cooperation (State Information Service of the Arab Republic of Egypt, 2015) cited on (Rawia, 2016). The other broader achievement is that there is increasing trading among the riparian countries and their representative regional blocks. The Ethiopian Investment Agency noted that the number of Sudanese investors is very high in Ethiopia, seconding Chinese. Egyptians investment reached to one billion USD, though now, it is in decline for various reason (Michago, 2015). Addis Ababa and Khartoum are taking serious steps towards integration. The two countries have recently agreed to increase the use of Port Sudan to serve the northern part of Ethiopia, raise funds to connect the port with Ethiopia by railway, complete the electric high-transmission lines for energy trade, and establish a free-trade zone along their border (Ethiopian New Agency, November 24, 2015) cited on (Rawia, 2016).

### 5.3. Challenges of Cooperation in the Blue Nile Basin



**Figure 5.4:** Observed Challenge of cooperation in Percent in the Blue Nile Basin

The analysis of interview findings above shows that 52% of challenges of cooperation in the blue Nile basin is due to previous(pre-colonial and postcolonial) agreements on the allocation of water resources in the basin and due to the fact that Egypt claims that it had historically access to the Nile and Exploited it for the benefit.

By way of appeasing the growing anti-British uprisings in Egypt, Britain agreed to Egypt's "historical and natural rights" over the Nile waters in an exchange of Notes with the Egyptian Government in 1929. (Arsano, 2007). In 1929, Egypt and the British Government (on behalf of Sudan and the riparian countries of Lake Victoria) reached a water sharing agreement over the Nile water. Under the terms of the 1929 Agreement, Egypt was assigned the right to a minimum of 48 km<sup>3</sup> water per year, while Sudan was assured to receive 4km<sup>3</sup>, leaving approximately 32 km<sup>3</sup> unallocated. However, this agreement did not include the major upstream water supplier, Ethiopia. The Agreement also noted that the East African countries were not to construct any water development projects in the Equatorial Lakes without consulting Egypt and Sudan (Swain, Ashok, 2011).

A new agreement on the sharing of the Nile River was reached in 1959 between Egypt and Sudan. From the newly-calculated annual flow of 84km<sup>3</sup> of water at Aswan, Egypt was to receive 55.5 km<sup>3</sup> and 18.5 km<sup>3</sup> were allotted to Sudan. The remaining 10 km<sup>3</sup>were allotted for mean annual evaporation and seepage losses from Lake Nasser behind the Aswan High Dam (Swain, Ashok, 2011). According to this new agreement, Sudan's share of the waters increased from the mere 4 bcm/year of the 1929 agreement to 18.5bcm/year. Ever since then Egypt and Sudan have maintained collaboration and alliance on the question of the Nile waters, especially in relation to other riparian nations in the upstream basin (Arsano, 2007).Furthermore, both countries agreed that they would not negotiate with any third party over the Nile water before they had developed a common position. According to this agreement, the two countries signed a Protocol on 17 January 1960 to establish a Permanent Joint Technical Committee to facilitate technical cooperation on the projects (Swain, Ashok, 2011)

Both the colonial and post-colonial agreements on the Nile at best ignored the interests and rights of the upstream countries (Arsano, 2007). Hence the upstream-downstream entanglement has increased as the demand for water resources continues to increase in each riparian country. In response to this, the downstream states have chosen to maintain a defensive stance, insisting that

they have “natural” and “historical” rights, and conveniently explaining that the rights arise from the past agreements, as well as the here-to-fore appropriation on the ground.

Most of the interviewees also highlight that lack of permanent institutional and legal framework is one of the big challenges that causes unilateral and uncoordinated water resource management and utilization in the river basin. The study analysis on the above (figure 5.4) shows that 26% of challenges on cooperation in the basin are due to lack of agreed and ratified legal agreement between the riparian countries and lack of permanent institution that coordinate and monitor water resource management and development activities in the basin.

The only “civilized” way to maximize one’s national interest with respect to the utilization and management of the transboundary waters is by establishing mutual benefit or “win-win” mechanisms in a new and cooperative framework of diplomacy and with a possible legal/institutional arrangement (Arsano, 2007). In March 1998, the Council of Ministers of Water Affairs of the Nile Basin States reached a broad agreement at Arusha, Tanzania over the sharing and managing the Nile water. This led to the formal launching of the Nile Basin Initiative (NBI) in February 1999 (Swain, Ashok, 2011). Member countries are: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda; Eritrea holds observer status. The NBI has two tracks of cooperation: The NBI Technical projects and the Cooperative Framework Agreement (CFA), processes. The technical tracks focused on the implementation of shared regional projects such as environmental protection, regional power trade, confidence building and socioeconomic development. The CFA, as political and legal track, discussed the equitable and reasonable utilization the Nile waters without causing any significant harm among the riparian countries (Michago, 2015)

The NBI is a transitional arrangement until the member countries agree on a permanent legal and institutional framework for sustainable development of the Nile basin (Swain, Ashok, 2011). For 10 years the NBI and its Eastern Nile Technical Regional Office (ENTRO) have played apposite role in building trust and encouraging coordinated planning through its joint multipurpose program (JMP) (Rawia, 2016). In May 2010 the ‘Nile Cooperative Framework Agreement, after a lengthy and protracted negotiation, was signed in Entebbe, Uganda, by the six upper riparian countries Ethiopia, Rwanda, Tanzania, Uganda, Kenya and Burundi. Egypt and Sudan declined to sign, and in showing disagreement they ‘freeze their membership in the NBI (Michago, 2015)

In June 2010, Egypt and Sudan announced freezing their membership in the NBI to contest the signing of the CFA by upstream Nile riparian. Sudan returned back to the NBI after two years, chaired its council of ministers (ENCM) in 2014– 15, and actively participated (Rawia, 2016). Although Egypt attended some of the initiatives' meetings, it did not officially announce its return to the organization, nor did it resume its full participation in the initiative's activities.

Though the upstream states considered the NBI a fruitful mechanism for bringing the six upstreamers in one Block and signed the CFA. Egypt and Sudan are opposed to the CFA, as they are apprehensive that it would take away their historical priority over the Nile water. While Article 4 of the CFA asks for the equitable and reasonable water use, Article 5 prevents harm to prior water users. Article 6 stands for the protection and conservation of ecosystems and the basin, while Article 8 makes prior informed consent mandatory for new water use (Swain, Ashok, 2011). The ongoing standoff between Egypt and Sudan with the upper riparian countries over an article of the Cooperative Framework Agreement shows shallowness in the claim. In fact, the Nile basin is far from achieving a basin-based water management institutional structure. In reality, very little progress has taken place to establish effective and cooperative water management institutions in the basin. Most of the riparian countries seriously continue to pursue large-scale unilateral dam construction.

Lack of trust and suspicion between riparian countries is another challenge which is mentioned by respondents during an interview. The study analysis shows that 23% of the respondent mentioned lack of trust between the riparian countries as one of the challenges of cooperation in the basin.

#### **5.4. Key informant interviewees recommendations Communication, information and knowledge sharing**

Improving communication, information and knowledge sharing between the riparian countries are the recommendations which are given by most of the respondents during the interview for successful management and proper utilization of resources in the basin and also to maximize the benefits which are generated from the river. The study analysis in the figure 7 below also shows that about 41% of the respondent in the study mentioned that: in order to optimize the benefits of

cooperation in the basin information and knowledge sharing between riparian countries play the major role.

**Figure 5.5:** Interviewee recommendation in percent

Developing common understanding is crucial for building trust among the countries. To achieve effective, Basin-wide management of the Nile, the NBI realized that a program of cooperation would need to confront the significant constraints relating to knowledge and information sharing (NBI, 2015). Transparent Scientific data and information sharing on the basin wide level is very crucial to effectively plan transboundary resource development and management activities. This information includes socioeconomic, hydrology, climate, meteorology, ecosystem, etc...the lack of data and information sharing between riparian countries hinder development opportunities and did not give countries motivation to collaborate. In the basin, even when the countries have data some of them would treat it as classified information at the political level to protect their national interests because water is such a critical resource in terms of national development (NBI, 2015). Limited coordination between countries on planning and management of water resource in the basin is risking the resource being tapped or development in the way that would bring benefit for some at the expense of losses to others. The data and information in the basin should be unbiased

and trustworthy and all basin countries should have an access to the data or the data should not have to belong only to one specific country.

Improving knowledge through researches and new technology is one way which helps for effective utilization and management of resource in the basin and fair decision making. The NBI has generated extensive new knowledge in the region, including research to highlight the realities of transboundary water flows. Monitoring of the Basin's water and related resources has been enhanced through remote sensing and strengthened ground-based monitoring, helping to improve the understanding of the status of the Nile Basin. The Nile Basin Hydromet monitoring system is currently being designed to address remaining gaps (NBI, 2015).

There is a very big gap and variation of capacity of the water sector in the basin. Some basin countries had lower overall capacity and institutional weakness with a limited technical knowledge in relation to integrated water resource management and development which has transboundary implication of their action. Building a strong team of water professionals with a comprehensive understanding of transboundary water issues is a key to achieving of effective transboundary resource utilization and management. To fill gaps in capacity NBI has kept a strong focus on capacity development. According to the (NBI, 2015) report, Across governments, the private sector, and civil society, the NBI has provided over 14,000 people with: Knowledge on technical issues, such as hydrology, to enable better understanding of water availability and impacts of water use, Skills to monitor the Basin, manage knowledge, analyze information, and use NBI tools, An understanding of how transboundary approaches can provide better opportunities for economic development through planning, management, and development of the resource, and shared costs, risks, and benefits. Through capacity building the riparian countries have to enhanced engagement between and among countries, and encourage the will for transboundary cooperation.

### **Political commitment and Trust building strategy**

The Political commitment of basin countries on transboundary water resources management and trust Building between the riparian countries is another important points which are recommended by many interviewees in the study. The analysis result of the above figure 7 also shows that 28%

of the respondents believe that Political commitment and trust building b/n the country is the key to have successful cooperation in the basin and to generate optimum benefits on the management and utilization of resources in the basin. Political ambiguity has a major impact on decisions by individual riparian countries in water resources management and development projects and plays a key role in determining the prospect of cooperation among basin riparian. As the term “ambiguity” refer to a situation where riparian countries are uncertain of each other’s future intentions and actions, and about the future results of those actions (Xun, Marc, & Dale, 2016). Trust is probably more important in situations where some partners expect to lose. Many respondents in the interview point out that Egypt’s long-standing position in opposing dam construction in upstream catchments of the Nile Basin may be due to fear of potential losses given the difficulties in assessing and addressing water retention and abstraction once, such dams are built. This can show that the communication between riparian parties at technical and political levels in order to establish a dialogue and develop a joint vision or strategic plans is an essential. Real collaboration requires mutual dependent relationship and trust. Benefit sharing requires a high level of trust between the parties. Joint institutions to study the costs and benefits of cooperation and examine potential cooperative solutions have often proved helpful in providing transparency and increasing trust (Maurice & L. Alan, 2002) Therefore, it needs to consider a prolong approach consisting of credible scientific evidence base and Strong Public Policy Engagement. Capacity building and sensitization of local stakeholders for an optimized water resource development and management is also important.

Ensuring political commitment that can result in institutional, policy and legal reforms in the countries concerned is the key to sustainable development of the transboundary resource. Political will and commitment is crucial to address multilevel, inclusive approach for water cooperation. Water resources management issues must be addressed at the local, national and at appropriate regional and international levels. Political will and commitment are also important for Innovative approaches on water cooperation which is the willingness to consider innovative ways to approach local, regional and international cooperation. Sustainable transboundary water management needs greater political and diplomatic engagement. It requires shared vision, shared goal and unity of effort which means a real collaborative approach on the basis of the Hydro diplomacy approach.

## **Institutional and Legal framework**

Management of the complex transboundary resource requires transboundary cooperation and all inclusive, strong, flexible and long-term frameworks that provide guarantees for all parties that have to be founded on trust. The study analysis result in the above figure 7 shows that 24% of the respondent in the interview recommended that it is important to have permanent institutional and legal framework in the Nile basin. A legal framework where the duty to cooperate is the central tenet can provide clear guidelines for future action on the Nile; define the rule for allocating, managing and developing water resource in different countries and sectors and put in place mechanism for resolving potential disputes and a case of noncompliance. The legal framework has to be accepted and internalized by all countries in order to be effective.

National water planning should consider the transboundary dimension in order to embrace joint management, planning and coordination of existing and future infrastructure. Regional plan should be realistic and linked to existing national water plan. In order to achieve this level of cooperation the Nile riparian countries need to have in place a strong multilateral institution that can play a balanced role in fostering convergence between national and regional plan. According to the respondent a permanent multilateral institution that is trusted by all Nile countries should be a powerhouse for effective thinking and action.

## **Integrated Cooperation and Development**

The other recommendation which was given by respondent to improve cooperation on shared water resource in the basin is to have strong regional cooperation between riparian countries in other development activities in the basin for example cooperation in Trade (Trade of agricultural products between countries, virtual water trades, power trade), investment, transport, infrastructure etc... .Water is a sacred resource and an agreement over a scarce resource alone is difficult. Inclusion of Multi level collaboration on the other developmental activities in the basin makes it easier to reach an agreement on collaboration of shared and scared water resources and will bring integration between the riparian countries in the basin. The study analysis shows that about 7% of the respondent in the study recommend that it is important to establish cooperation through multipurpose uses of water through climate resilient growth and regional integration. It is also important to have all inclusive regional cooperation through leveraging the Nile resource to foster economic growth through the process of regional integration.

(Cascão, 2017) Argues, assumption that “wider regional economic cooperation can actually lever more effective water cooperation” has received insufficient political attention. Call for regional economic cooperation and integration should be for a suite of tools to foster cooperation over transboundary waters through increasing trade, market integration, intra-basin investments and joint infrastructure development between Nile countries. Through this greater connectivity, Nile countries can then move jointly toward stronger economic development at regional and national levels. The other poles of cooperation are the state or basin levels. For example, Eastern Nile countries can incorporate new issues using bilateral or multilateral agreements on issues not confined to the river. These agreements can result in sector-based cooperation or a deeper integration as an economic community. On the basin level, the new issues can be embedded in current transboundary water basin cooperation arrangements.

## Chapter VI

### CONCLUSIONS AND IMPLICATIONS

#### 6.1. Introduction

The chapter commences with an overview of the basin water challenges, research objectives, followed by summarizing study findings, methods applied, conclusions and finally, limitation of the study and recommendations for further study. The research identified that the existence of an inadequate system of cooperation and lack of hydro political integration among the riparian countries on the transboundary water resources are the major problems of the basin water.

The overall aim of this research is to identify and optimize all the benefit of water cooperation in the Blue Nile River that contributes to the sustainable development and management of the transboundary River basin, which have been achieved through four sub objectives.

The first objective that state to determine the role of water cooperation on the management of ecosystem on the transboundary Blue Nile River basin was achieved by indicating the importance of collaborative and integrated practices in protecting watershed, improving water quality, reduction of sedimentation of downstream hydraulic structures, land use and management among the riparian countries.

The second objective proposed to examine the economic value of water cooperation on transboundary Blue Nile River was achieved by recommending the significance of establishing economic integration, hydropower interconnectivity, power trade and implementation of smart irrigation at downstream irrigable land in Sudan and Egypt.

The third objective of the research is to highlight the importance of cooperation and water networking to reduce tensions that may come from ever increasing and competitive water demand in the basin countries. This was achieved by informing the importance of building trust among the upstream and downstream basin stakeholders by sharing the right information for communities and using water diplomacy, the so called ideational power.

The fourth objective stated to analyse water cooperation on economic integration between Ethiopia and other riparian state was achieved by recommending the importance of hydropower

interconnectivity, scientific data sharing, joint research and development and widening areas of economic integration and interdependence among the basin states.

Conclusions and implications related to the findings of the study are presented in the next section.

## **6.2. Summary/Findings of the study**

### **Challenges on cooperation**

The study tries to find out the observed fundamental challenges on cooperation in the Blue Nile river basin. Accordingly, (1) suspicion and lack of trust, (2) lack of institutional and legal frameworks and (3) previous agreements on the allocation of water resource are the three major challenges observed in the basin.

The previous (pre-colonial and postcolonial) agreements on the allocation of water resources in the basin is one of the main challenges of cooperation in the basin this agreement ignored the interests and rights of the upstream countries. The downstream states have chosen to maintain a defensive stance, insisting that they have “natural” and “historical” rights, and conveniently explaining that the rights arise from the past agreements, as well as the here-to-fore appropriation on the ground is the main challenges. Lack of permanent institutional and legal framework is another big challenge that causes unilateral and uncoordinated water resource management and utilization in the river basin. The ‘Nile Cooperative Framework Agreement, was signed in Entebbe, Uganda, by the six upper riparian countries, Ethiopia, Rwanda, Tanzania, Uganda, Kenya and Burundi. Egypt and Sudan declined to sign as they are apprehensive that it would take away their historical priority over the Nile water. Suspicion and lack of trust between the riparian countries is another challenge which is highlighted in the study by many respondents.

### **Costs of non-cooperation**

The study also analyzed the costs of noncooperation in the basin. Unilateral action on shared water resource will lead to underutilization of resources and reduces the maximum benefit that generates from Nile water resource which affects economic, social and environmental development of riparian countries. Noncooperation also results instability as the tension and

conflicts arise due to non-consulted actions by riparian country on shared water resources. Unilateral action on shared water resource causes suspension between riparian country which leads to lack of trust and this lack of trust will result in tension. Unilateral action of riparian country leads to environmental degradation in terms of quality and quantity of resources.

Whenever there is unilateral action on shared water resource there is a problem to access or share data between countries, lack of exchange information and consulted action on a shared water resource which hinders the maximum benefit that the riparian country generate from shared resources.

### **Benefits of Cooperation**

The Blue Nile River is an important shared resource of Ethiopia, Sudan and also Egypt as it is the major contributor of water to the main Nile River. The study identified different type of benefits that can be generated from cooperation on the basin.

This benefit includes:

#### ***Hydropower Generation and Irrigation***

Hydro power generation which is a non-consumptive use of water in the system is one of the major direct economic benefits that can be achieved from cooperation on the Blue Nile River basin. Upstream part of the Blue Nile River is suitable for huge hydroelectric power generations. The hydroelectric power generation enables Ethiopia to meet its domestic power demand and enable to generate foreign currency. Other riparian country (Sudan and Egypt) will also benefit from the availability of cheap electricity through power connection with Ethiopia. Using hydropower as a source has also a greater importance in terms of environmental protection and climate change mitigation as it reduces carbon dioxide emissions.

The other direct economic benefit which is obtained due to the cooperative water management and development activities performed on the upper Blue Nile river basin is irrigation. The availability of Regulated water flow throughout the year enables the downstream countries (Sudan and Egypt) to use their large irrigation land for crop production. The regulatory capacity of the reservoirs located in Ethiopia would increase irrigation water availability in Sudan

### ***Improving water saving, sediment retention and conservation***

Environmental benefits was explained in terms of flood regulation, reduced siltation, reduced evaporation loss, the availability of regulated flow throughout the year, and reduced upstream fertile soil erosion and so on. Dams, which are constructed on the upstream of the basin and the environmental conservation activities which are performed on the upstream of the river basin have a greater advantage for the conservation of the environment, mainly in terms of protecting soil erosion from Ethiopian Highlands, avoiding flooding hazards during rainy seasons and reduces siltation problem on hydraulic structures on downstream countries especially in Sudan and Egypt. Hydropower structures reduce sedimentation of downstream structures, thereby increasing their effective storage and useful life. Building of dams upstream along Ethiopia's Blue Nile where rocky mountain soils and narrow gorges would reduce seepage and evaporation by 50% would have increased the available water by an estimated 6 billion cubic meters or more.

### ***Information sharing and management***

Properly organized and shared information provides access to up-to-date, accurate and better decision making and planning practices in the basin. The other benefits of cooperation which are mentioned in the study are the importance of scientific data and information sharing between countries, and knowledge sharing and capacity buildings such as

- Exchange of information,
- Information on the basin water balance system,
- Improved information system on water demand and supply, and
- Improve awareness on water utilization of each riparian country.

### ***Research and development***

There is lack of well-organized and collaborative research practices in the basin .Focus should be given to integrated researches that proactively respond to the riparian countries demand of generating and disseminating new knowledge and technology, strengthening and developing the capacity of the basin stakeholders.

Some of this includes:

- Strengthening the capacity of basin research centers,
- Formulating integrated and interdependent joint programs and projects, and

- Establishing collaborative research and development activities.

### ***Peace and security***

Benefits from hydro politics is another type of benefit generated from cooperation on transboundary water resource. Peace and security of the region and trust among the riparian countries are the major benefit obtained from cooperation on shared water resources. This benefit can be evaluated against the increase in the level of trust and cooperation, enhanced regional peace and security, the reduction of potential conflict, continuing and sustainable riparian collaboration, and greater emphasis on regional projects and enhanced risk mitigation.

### **Key informant Interviewees' recommendations**

The interviewees put recommendation to improve cooperation, networking and communication between riparian countries in the basin. The first recommendation which was given by the respondent is to improve communication, networking and knowledge and information sharing between riparian countries.

The respondents highlighted that developing a common understanding in the basin, Transparent Scientific data and information sharing on the basin wide level are very crucial to effectively plan transboundary resource development and management activities. They also point out that Lack of data and information sharing between riparian countries hinders development opportunities and did not give countries motivation to collaborate. The data and information in the basin should be unbiased and trustworthy and all basin countries should have an access to the data or the data should not have to belong only to one specific country.

Improving knowledge through researches and new technology is also another recommendation which is given by interviewees for effective utilization and management of resource in the basin and fair decision making. Therefore, Building a strong team of water professionals with a comprehensive understanding of transboundary water issues is a key to achieving of effective transboundary resource utilization and management.

Through capacity building the riparian countries have to enhanced engagement between and among countries, and encourage the will for transboundary cooperation. The Political commitment of basin countries on transboundary water resources management and trust Building between the riparian countries is another important points which are mentioned and recommended by many interviewees in the study. Benefit sharing requires a high level of trust between the parties.

Ensuring political commitment that can result in institutional, policy and legal reforms in the countries concerned is the key to sustainable development of the transboundary resource. The Communication between riparian parties at technical and political levels in order to establish a dialogue and develop a joint vision or strategic plans is an essential.

Having a permanent institutional and legal framework where the duty to cooperate is the central tenet that can provide clear guidelines for future action on the Nile is the other recommendation which were given by respondents. Having a permanent multilateral institution that is trusted by all Nile countries should be a powerhouse for effective thinking and action.

Water is a sacred resource and an agreement over a scarce resource alone is difficult. As it is recommended by the interviewees in the study Inclusion of Multi level collaboration on the other developmental activities in the basin makes it easier to reach an agreement on collaboration of shared and scared water resources and will bring integration between the riparian countries in the basin.

### **6.3. Conclusions and recommendations**

The hydro politics, governance and managing a transboundary river basin is complex. Smart and integrated ways of water resources management is required that will improve decision making process of the basin water resources.

On ensuring the benefits and sustainable development of the Nile River basin, there should be a win-win development strategy, adaptive-integrated water management approach, appropriate transboundary water policy and planning, adequate institutional arrangement and legal frameworks to overcome the water related problems in the basin. Equitable utilization and

sustainable water resources development and management in the Nile basin will be achieved through by maximizing benefits from collaborative practices among the riparian countries.

The study finds out that there are different types of benefits which are generated due to the cooperation of riparian countries in the Nile Basin. In the Blue Nile River basin it can be possible to obtain the four types of benefit which can be generated due to cooperation (Environmental Benefit, Direct economic benefit, Benefit from hydro politics and the benefit beyond the river). Hydro power generation on the upstream part of the river basin is one of the major benefits that can be obtained in the basin. It has a financial benefit in terms of foreign currency generation, availability of cheap electricity for downstream countries and as a climate mitigation strategy hydropower is a source of clean energy. The hydro power structures or dams built on the upstream of basin can provide benefits related to the environment (In terms of reduced flood, reduced fertile soil erosion, reduced downstream structures siltation and reduced evaporation) and also helps the downstream countries to irrigate their large irrigation land due to the availability of regulated flow throughout the year. In terms of regional integration it is an opportunity for the riparian country to cooperate on power trade in the basin and beyond the basin. Therefore the riparian countries should cooperate in Hydropower generation, particularly on the upstream part of the basin that can enable the riparian country to generate extended types of benefit in the Blue Nile basin.

Developing a common understanding in the basin, Transparent Scientific data and information sharing on the basin wide level are very crucial to effectively plan transboundary resource development and management activities. But the information sharing should not only focus or limited to scientific data at the researcher, expertise or politician level. The societies on the ground or (local people) should also get the right and appropriate information. The society in the riparian country should understand the benefits of cooperation on the river basin and the costs of noncooperation in the basin. The riparian countries have to be committed to transfer right information for their people and the local people should also actively participate in the planning, management and development of shared water resource. The people should understand the role of institution and legal frameworks in the basin so that people will be on the same page of speak.

The previous (pre-colonial and postcolonial agreements) on the allocation of water resources in the basin is one of the main challenges of cooperation in the basin. Nile riparian states do not

recognize the 1959 Nile treaty; they prefer a new form of cooperation under the CFA. The downstream states have chosen to maintain a defensive stance, insisting that they have “natural” and “historical” rights, and conveniently explaining that the rights arise from the past agreements. Nile riparian countries need to sign 1997 UN Water Conventions on the Non- navigational use of water courses which contains major strategies for transboundary negotiation.

It is unfortunate that NBI after becoming 17 or 18 years have not transferred to its permanent institutional platform. Lack of permanent institutional and legal framework is a big challenge that causes unilateral and uncoordinated water resource management and utilization in the river basin. Nile riparian countries need to have in place a permanent, strong, multilateral institution that is trusted by all Nile countries.

Multilevel collaboration on the other developmental activities in the basin makes it easier to reach an agreement on collaboration of shared and scared water resources. Through this greater connectivity, Nile countries can move jointly toward stronger economic development at regional and national levels. The Nile basin countries should improve cooperation on shared water resource through strong regional cooperation in other development activities in the basin for example cooperation in Trade (Trade of agricultural products between countries, virtual water trades, and power trade), investment, transport, infrastructure etc.

**Sustainable development and management of the trasboundary water resources** will be achieved through cooperative water resources management and development activities of basin countries that takes long time process. In addition to long and medium term plan, it is vital to have short-term development plan as future is the impact of present.

This will be achieved through the following:

- Efficient way water management in the basin would bring a positive impact in sustaining the resources
- Application of scientific techniques useful for optimum and efficient ways of equitable utilization of the water resources
- Local community participation
- Improving socioeconomic and political stability of each state in the basin
- Environmental protection

**The benefits of cooperation and collaboration among the riparian countries will be further improved through,**

- improving the level of cooperation and collaboration among the riparian countries,
- establishing economic integration, which is Africa 2063 agenda of African country integration,
- building trust among the upstream and downstream basin stakeholders (decision makers, Local communities, etc.) by sharing the right information for communities and using water diplomacy, the so called ideational power,
- Widening areas of economic integration and interdependence among the basin states,
- strengthening the hydropower interconnectivity in the basin countries, and
- Implementation of watershed and land use management.

#### **6.4. Limitation of the study**

This study has been constrained by the following;

- **Time constrained:** the study was carried out within four months. A time was too short to gather enough data on the subject. It was not possible to conclusively collect primary data (Key informant groups for interview) as more time is required to collect enough information from all the three basin country. The study includes most of the interviewees from Ethiopia and few from Sudan and didn't include interviewees from Egypt.
- **Data collection:** Challenges in getting the selected key informant groups for interview and data collection; due to the fact that senior experts and higher official in some ministry offices are not available due to pre-planned workload and meeting.
- **Quantitative benefits:** This study has limited itself to the analysis of qualitative benefits generated through cooperation between basin countries in the management and development of water resources. The study didn't conduct a detailed or quantified benefit that can be generated through cooperation in the basin.

## **6.5. Indicating future research directions**

The researcher in considering the study as a primary stage and interested to maximize opportunities emerged from the research and peruse further research works to implement the findings outlined and establish accessible and easy ways of organizing benefits of collaboration on tranboundary water resources.

Moreover,

- A similar study can be conducted which include all the basin countries on the optimization of benefit of cooperation in the basin countries.
- Further study can be conducted specially on the challenges of cooperation between the Nile riparian countries.
- A detailed study can be conducted on quantifying the benefits of cooperation and cost of noncooperation in the Blue Nile

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## Appendices

### Appendix A: Objectives, achievements and recommendation matrix

Study Objectives	Achievements with respect to objectives	Major Sections that indicates /support findings	Recommendation according to objectives
1. To determine the role of water cooperation on the management of ecosystem on the transboundary Blue Nile	<ul style="list-style-type: none"> <li>- Protection of fertile soil erosion from Ethiopia highlands</li> <li>- Reduce flooding of downstream countries</li> <li>- Reduce sedimentation of downstream hydraulic structures</li> <li>- Reduces evaporation loss</li> <li>- Regulation of flow</li> <li>- Improve water quality</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter IV, Section 4.2, BC Theme 1</li> <li>• Chapter VI, section 5.2</li> </ul>	<ul style="list-style-type: none"> <li>• Improve Watershed and land use, management</li> <li>• Improve the level of cooperation and collaboration among the riparian countries.</li> </ul>
2. To examine the economic value of water cooperation on Trans boundary Blue Nile river.	<ul style="list-style-type: none"> <li>- Hydro power generation to meet domestic power demand</li> <li>- Availability of cheap electric power for downstream countries</li> <li>- Generation of foreign currency through power trade</li> <li>- Irrigation of large downstream irrigable lands in Sudan and Egypt</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter IV, Section 4.2, BC Theme 3</li> <li>• Chapter VI, Section5.2</li> </ul>	<ul style="list-style-type: none"> <li>• Establish economic integration, which is Africa 2063 agenda of African country integration</li> <li>• Hydropower interconnectivity</li> </ul>
3. To highlight the importance of cooperation and water networking to reduce tensions that may come from ever increasing and competitive water demand in the basin countries.	<ul style="list-style-type: none"> <li>- Avoid conflict and produce security in the region</li> <li>- Due to peace and security in the region's economy and productivity enhanced</li> <li>- Reduce the cost which country spends for the military</li> <li>- Bring peace and political sustainability in the region.</li> <li>- Countries focus on Development rather than another issue</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter IV, section 4.2, BC Theme 5</li> <li>• Chapter VI, Section 5.2</li> </ul>	<ul style="list-style-type: none"> <li>• Building trust among the upstream and downstream basin stakeholders (decision makers, Local communities, etc.) by sharing the right information for communities and using water diplomacy, the so called ideational power</li> </ul>
4. To analyses water cooperation on economic integration between Ethiopia and other riparian state.	<ul style="list-style-type: none"> <li>- Hydro power interconnectivity and power trade</li> <li>- Interconnectivity by road (Ethiopia and Sudan)</li> <li>- Increase Tourism and tourist flow</li> <li>- Scientific data and information sharing b/n riparian countries , capacity building, , researches</li> </ul>	<ul style="list-style-type: none"> <li>• Chapter IV, Section 4.2, Theme 6,7,8</li> <li>• Chapter VI, Section 5.2</li> </ul>	<ul style="list-style-type: none"> <li>• Widening areas of economic integration and interdependence among the basin states</li> <li>• Establish economic integration, which is Africa 2063 agenda of African country integration</li> </ul>

## Appendix B: List of key informant professionals interviewed

No.	Name of respondent	Profession	Institutions
1	Dr Yacob Arsano	Associate professor in political science and International Relations, Researcher and Negotiator in the Nile water issues	School of social sciences, Department of political science
2	Mr.Fekahmed Negash	Executive Director	Eastern Nile Technical Regional Office (ENTRO)
3	Dr. Omer Mohammed Ahmed	Senior regional project coordinator.	Eastern Nile Technical Regional Office (ENTRO)
4	Mr. Ayyik De-Juac Bol	Regional Finance and Administration head	Eastern Nile Technical Regional Office (ENTRO)
5	Mr. Abiti Getaneh Gebremeskel	Research and Development Directorate Director	Ministry of Water, Irrigation and Electricity
6	Mr. Teshome Atinafe	Transboundary rivers affair Directorate Director	Ministry of Water, Irrigation and Electricity
7	Mr. Tefera Beyene	Advisor to the Ministry on Transboundary water resource affairs	Ministry of Water, Irrigation and Electricity
8	Mr. Asmamaw Kume	Director for basin Administration directorate	Ministry of Water, Irrigation and Electricity
9	Dr. Belay simane	Lecture and Researcher on the Blue Nile	collage of developmental studies, Environment and Development center
10	Prof Zerihun Woldu	Professor of Ecology, Director in charge and delegate vice president for research and Technology transfer	Addis Ababa University
11	Prof. Tesfaye Tafese	professor at center for Africa and oriental studies, experienced in hydro politics and problems related to transboundary river basin	Center for Africa and oriental studies
12	Dr. Yilma Seleshe	Associate professor in hydrology and researcher in hydrology and water resource management, also participating in negotiation on	Addis Ababa Institute of Technology

<b>No.</b>	<b>Name of respondent</b>	<b>Profession</b>	<b>Institutions</b>
		the Nile issues	
13	Dr. Taye Alemayehu	Assistance Professor and researcher on ground water hydrology	Ethiopian Institute of water resource
14	Dr. Tadese kassa	Associate professor and lecture courses related to law and policy advisor	Collage of law
15	Mr. Dejene Sahilu	PHD researcher on water Availability of Blue Nile ition: Researcher and MSC candidate	Abbay/Nile Basin Authority
16	Mr. Mohamed Zeko	PHD , researcher on Optimization Model of the Blue Nile Water Resources	Ethiopian Institute of Water Resource
17	Mr. Yared Worku	MSc candidate on water resource engineering and management	Ethiopian Institute of Water Resource
18	Mr. Gebeyaw Sitotaw	PHD researcher on Eastern Nile River Basin Water Security Planning and Management system	Ethiopian Institute of Water Resource
19	Mr. Emanuel Abate	PHD researcher on Nile Basin water footprint	Ethiopian Institute of Water Resource

## Appendix C: Request Letter to access Addis Ababa University Library

Addis Ababa, Monday 16th April 2018

**AAU Main Library**  
Addis Ababa University  
Addis Ababa, ETHIOPIA

**Attn:** Mesfin Gezahegn  
Head. AAU Main Library

Dear Ato Mesfin,

### **Letter of Request to Access Addis Ababa University Library**

I am Rehima Kedir Mohammed, an Ethiopian and a second year Water policy student at the Pan African University, Institute of Water and Energy Sciences (including climate change) at Tlemcen, Algeria.

I write this letter requesting for permission to access the library of Addis Ababa University. Currently, I am working on my MSc thesis which requires the need for more secondary data, which is a major requirement to successfully complete my research work.

Accordingly, I am conducting my MSc Research entitled "OPTIMIZING THE BENEFITS OF WATER COOPERATION ON TRANSBOUNDARY RIVERS: A CASE OF BLUE NILE RIVER IN ETHIOPIA" under the supervision of Dr Azage Gebreyohannes from Ethiopian Institute of Water Resources, Addis Ababa University, Ethiopia.

Attached herewith, please find a page of introductory letter prepared by my home University.

This is therefore, to kindly request your esteemed office to allow me to use the library resources of Addis Ababa University. Thank you for your time and consideration of this request.

Yours faithfully,



Rehima Kedir Mohammed (**Applicant Student**)  
MSc Water Policy Student  
Pan African University institute of water and Energy sciences (PAUWES)  
Tlemcen, Algeria

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#### **Application Endorsed by (supervisor):**



Azage Gebreyohannes (PhD)  
Assistant Professor in Transboundary Water Management  
Education Coordinator, Ethiopian Institute of Water Resources  
Addis Ababa University  
t: +251 934 401032 (Mobile), e: aazage@gmail.com or azage.gyohannes@aau.edu.et

## Appendix D: Internship letter of recommendation from Nile Basin Initiative



ENTRO  
**NILE BASIN INITIATIVE**  
INITIATIVE DU BASSIN DU NIL

P.O. Box 21173/1000  
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[entrod@nilebasin.org](mailto:entrod@nilebasin.org)  
Web site: [www.nilebasin.org/entro](http://www.nilebasin.org/entro)

Ref: ENTRO/432/2018

Date: July 19, 2018

Pan African University Institute of Water and Energy Sciences (Including climate change)  
Tiempcen, Algeria

Dear Sir/Madam

This letter is to certify that **Ms. Rehima Kedir Mohammed** has been hosted as an intern and visiting MSc student in the Eastern Nile Technical Regional Office (ENTRO) from 20<sup>th</sup> May to 20<sup>th</sup> of July 2018. Her research, which is entitled "Optimizing the Benefits of Cooperation on Transboundary Rivers: A case of Blue Nile River" is very relevant and would contribute to the achievement of objectives of NBI/ ENTRO.

We hope she had a productive stay in our office and we look forward in future engagement with her and your University.

Sincerely,

  
**Fekahmed Negash**  
Executive Director



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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 E: Internship letter of recommendation from Administration for Refugee-Returnee Affairs**



## Appendix F: List of Qualitative data collection Questionnaires

### Introduction

I am Rehima Kedir Mohammed second year Masters of Science student in Water Policy at the Pan African University, Institute of Water and Energy Sciences hosted at the University of Tlemcen, Algeria. I am working on my MSc research entitled “**Benefits of Water Cooperation on transboundary Rivers: A Case of Blue Nile River in Ethiopia**”. First of all, I would like to thank you for showing your willingness to answer my interview questions and agreed to share your knowledge and ideas. And I am very happy to have you as part of my research study as your knowledge and experience is very helpful for successful completion of my study.

### Respondent's Information

Name:

Organization:

Position:

### Qualitative interview questions

1. What benefits Ethiopia will generate from cooperation in terms of, **Environment, Economy and peaceful relation** within riparian country?
2. What benefits Sudan and Egypt will generate from cooperation in terms of **Economy, Environment and peaceful relation** within riparian country?
3. What kind of Economic activity will generate maximum benefit for Ethiopia, Sudan and Egypt, according to their location in the river basin?
4. What is the **cost of non-cooperation** with riparian countries in terms of **Economy, Environment and peaceful relation (hydro politics)**?

5. **What are the observed Challenges on cooperation** after establishment of NBI?

Is difference b/n economic level is a challenge?

6. What are your recommendations/comments on improving **communication, networking and cooperation** among the riparian countries that leads to peace and sustainable?

7. What makes River Nile different from other transboundary river?

8. **What lesson** Nile Basin Initiative (NBI) or riparian states should take from other successful transboundary river basin organization in Africa, Europe or Asia?

9. How transboundary water cooperation contributes to successful **achievement of SDG?**

**Thank you very much for your answers!**

**Appendix G: Summarized expenses for the study.**

<b>S.No</b>	<b>Item</b>	<b>Unit</b>	<b>Unit price in dollar (\$)</b>	<b>Total cost (\$)</b>	<b>Remark</b>
1.	Transportation cost ( to and From Ethiopia)	Ls	1000	1000	Air ticket cost
2	Transportation cost(From Algiers to Tlemcen) +accommodation	Ls	95	95	Air ticket cost +1 day accommodation at Algiers
3	Internet cost	Ls	800	800	To Down load different materials and papers
4	Printing of questioners, check list, Write up and editing	Ls	160	160	For conducting study
5	Transport/vehicles used during Data collection	Ls	545	545	To different stake holders and study area
6	Miscellaneous and Stationary costs	Ls	400	400	
<b>Total</b>				<b>3,000 \$</b>	